PanelMate Power Series Installation Guide

Cutler-Hammer

EATON

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Preface

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1. Stock availability, proof of shipment, or to place an order.
2. Expedite an existing order.
3. Product assistance and product price information.
4. Product returns other than warranty returns.

For information on your local distributor or sales office, call the Cutler-Hammer Tech Line at 1-800-809-2772.

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Cutler-Hammer
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Westerville, OH 43086-6166

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173 Heatherdown Drive
Westerville, OH 43081

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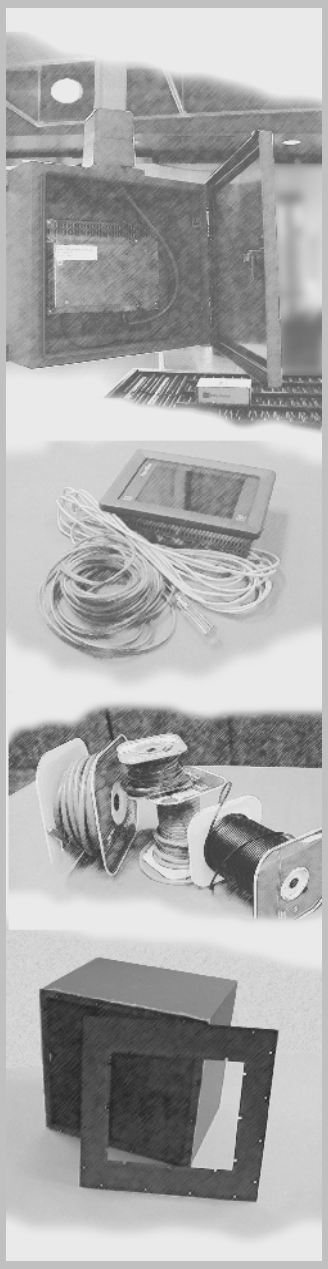
1 Introduction

Thank You

for choosing the PanelMate Power Series for your operator interface. When properly installed, your PanelMate Power Series unit will provide years of dependable, trouble-free operation in rugged industrial environments**.**



The Three Most Critical Installation Issues

With more than 100,000 PanelMate units currently in operation since its introduction in 1986, Cutler-Hammer has helped many users troubleshoot their PanelMate installations. This Installation Guide is intended to help you avoid the common mistakes made by first-time PanelMate users.

Three aspects of your installation are critical to long life and reliable operation:

Enclosure selection

Communication cable selection, shielding, grounding and termination

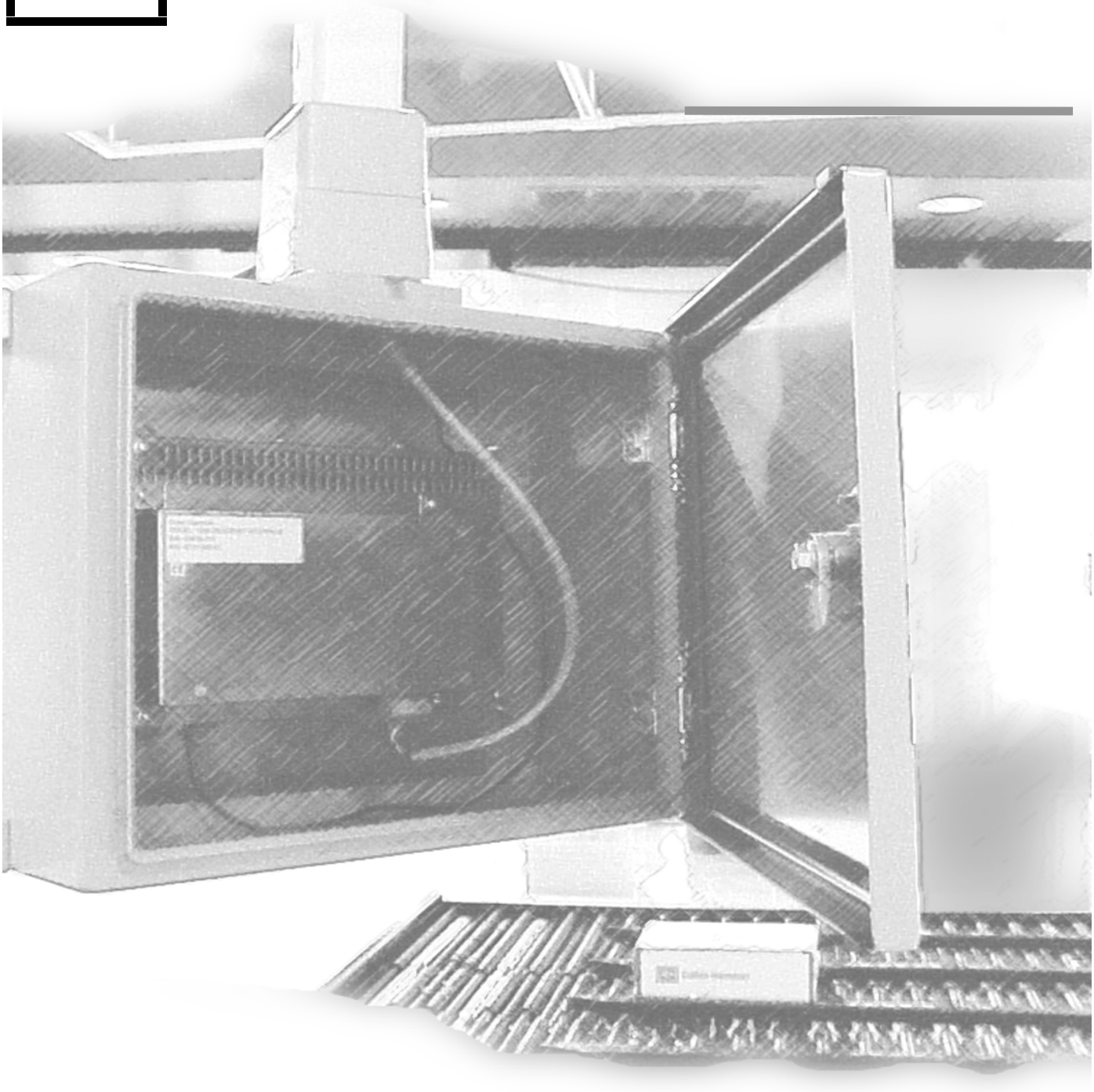
Cable segregation and placement.

This Installation Guide reviews each of these areas, providing recommendations and guidelines for making knowledgeable installation decisions.

Replacing Existing PanelMate Power Series Units

If you are planning to replace an existing PanelMate Power Series unit with a new PanelMate Power Series unit, there are several very important steps to take to ensure proper operation. See **Chapter 5: Replacing Existing PanelMate Units**.

2 Enclosure Selection



Chapter Overview

The enclosure for your PanelMate unit must provide protection against conditions that can shorten the life of your PanelMate or cause improper operation:

- Protection from oil, dust, moisture, corrosive vapors and other airborne contaminants
- Protection from ambient temperatures above or below unit specifications
- Protection from electromagnetic interference

This chapter reviews enclosure choice considerations and provides a guide for sizing your PanelMate unit's enclosure.

Potential Problem Areas

Enclosure is too small for the operator interface – not enough free space for efficient convection cooling

Enclosure is filled with other heat-generating devices – internal temperature rises above the operator interface's ratings

Enclosure is mounted near devices generating high levels of magnetic or electrical interference

Free air space is not present around the outside of the enclosure – prevents the enclosure's metal panels from dissipating internal heat

Enclosure Rating

The front panels of PanelMate Power Series units provide a NEMA 4 or NEMA 12 rating when mounted in a correspondingly-rated enclosure. Some PanelMate models are also rated for NEMA 4X installations. Make sure the enclosure you choose will meet or exceed your application's NEMA rating requirement.

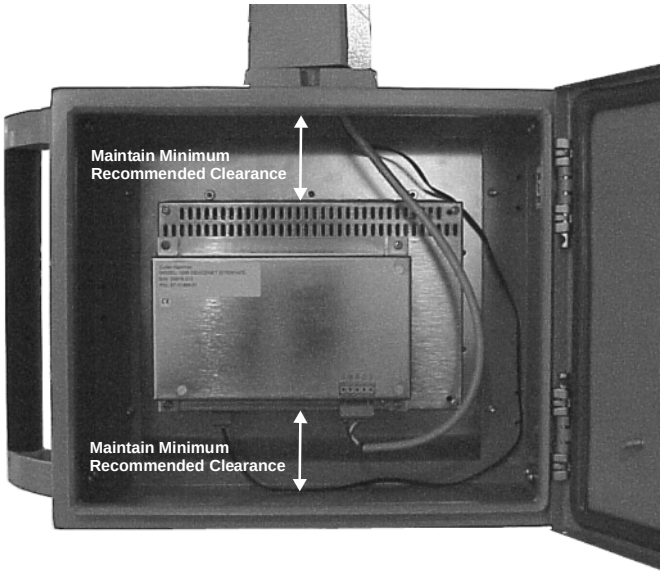
Enclosure Construction

Cutler-Hammer recommends an enclosure constructed of cold rolled steel. This will help guard your unit against electromagnetic interference, as well as provide proper structural support and good heat dissipation.

Enclosure Sizing and Unit Positioning

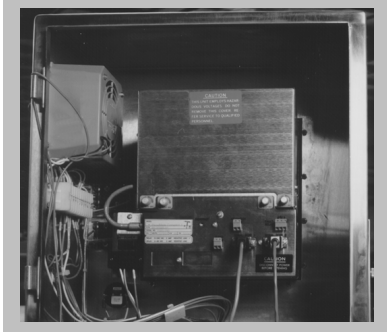
Careful enclosure sizing is important for proper heat dissipation and easy installation and maintenance. For efficient convection cooling, free space is needed around the PanelMate unit. Convection cooling draws a vertical column of air upward over internal circuitry through the vents in the unit. In all installations, the cooling air must not exceed the maximum specified ambient temperature. This determination must be made for the maximum expected plant temperature (maximum temperature of the air surrounding the enclosure.)

- Maintain recommended free space above and below the PanelMate unit. (see table on next page)
- Avoid mounting other heat-generating equipment near the PanelMate unit. If no other location is available, mount the equipment beside or behind the PanelMate unit. If side/rear space is not available, it is preferable to mount the other equipment above rather than below the PanelMate unit. Be sure to maintain the recommended free space area between the PanelMate unit and the other equipment.
- Leave room for easy access to circuit boards, wiring/cable connections, and regular maintenance.



Recommended Free Space and Maximum Operating Temperature Table

The free space area is the space between the PanelMate unit's electronics and the top or bottom of the enclosure



Internal fans help provide a uniform ambient temperature inside the enclosure

PanelMate Power Series Model	Maximum Operating Ambient Temperature	Unit Heat Output	Recommended Free Space Above/Below Unit
1500 Series	50°C Gray scale & Color TFT 40°C Color Dual-scan	41 BTU/hr (12W)	2" minimum
1700 Series	50°C Grayscale & Color TFT 40°C Color Dual-scan	78 BTU/hr (23W)	2" minimum, 4" recommended
2000 Series Grayscale	50°C	188 BTU/hr (55 W)	6" minimum
2000 Series Color	50°C	273 BTU/hr (80 W)	6" minimum
3000 Series Grayscale & Color Dual-scan	40°C	119 BTU/hr (35W)	6" minimum
3000 Series Color TFT	50°C	119 BTU/hr (35W)	6" minimum
4000 Series	50°C	273 BTU/hr (80W)	6" minimum
5000 Series	50°C	137 BTU/hr (40W)	6"minimum

If the inside temperature of the enclosure is above the PanelMate unit's recommended range (see table), you must use filtered fans, heat exchangers, or air conditioners to lower the temperature. Because hot air rises to the top of an enclosure, the temperature inside can vary greatly from bottom to top. A fan can be used to circulate air within the enclosure to maintain a more uniform temperature. Make sure the magnetic properties of the equipment used to cool the enclosure do not interfere with your PanelMate unit's operation. CRT monitors are especially susceptible to magnetic fields.

Note: If an air-purged enclosure is used, it is recommended that the inside/outside pressure differential not exceed .5 PSI.

The following sizing table is offered as an aid in the selection of enclosures to be used with PanelMate products. Cutler-Hammer offers no guarantee or warranty to the specific applicability of this table as actual conditions may vary and methods of the use of our products are beyond our control. For specific information about enclosure selection and cooling methods, contact your enclosure vendor.

Note: Cutout and unit dimensional information for all PanelMate Power Series units is provided in **Appendix A**.

Enclosure Size vs. Average Internal Temperature Rise

This table makes the following assumptions:

- Enclosure is fabricated from cold rolled steel
- All sides of the enclosure are uninsulated (free standing)
- Recommended minimum clearance between the PanelMate unit and the top and bottom of the enclosure
- No other heat-generating equipment is installed in the enclosure

Note: The temperature rise shown represents the temperature rise in the enclosure above the outside temperature. For example: if the temperature outside the enclosure in 35°C and the temperature rise in the enclosure is 10°C, then the average temperature inside the enclosure will be 45°C.

PanelMate Model	Enclosure Size	Avg. Internal Temp. Rise
1500 w/keypad	16x16x4	6.8° C
	16x16x6	6.2° C
	20x16x6	5.6° C
1500 w/touchscreen	12x12x4	11.4° C
	12x12x6	10.8° C
	12x14x6	9.8° C
1700 w/keypad or touchscreen	16x16x4	10.8° C
	16x16x6	9.3° C
	20x16x6	7.7° C
1700 w/touchscreen	12x12x6	14.4° C
	12x14x6	12.8° C
2000 Gray Scale	24x20x12	10° C
	24x24x12	8.9° C
	30x24x12	7.2° C
2000 Color	24x20x12	15° C
	24x24x12	12.8° C
	30x24x12	10.6° C
All 3000	24x20x8	7.2° C
	24x24x8	6.7° C
All 4000	30x24x16	9.4° C
	30x24x20	8.3° C
	36x30x16	6.6° C
5000 w/ keypad	30x24x8	6.° C
	30x24x10	5.6° C
5000 w/touchscreen	24x24x8	7.2° C
	24x24x10	6.7° C
	24x30x8	6.1° C

3 Communication Cable Selection, Shielding, Grounding & Termination

Chapter Overview

This chapter contains a summary of seven popular communication interface options. Each summary provides specific recommendations, guidelines and installation tips

Potential Problem Areas

Improper grounding of communications cable, causing excessive radiated emissions

Incorrect cable or pinout

Improper or lack of termination on PanelMate units located at the end of a communications network

Failure to maintain minimum/maximum cable lengths between nodes on a communications network

Exceeding recommended cable or total network distance

A variety of communication interface options are available for PanelMate Power Series products. Options include:

- RS-232 and RS-422 based communications
- RS-485 multi-drop communications
- "Open" multi-drop networks (examples: DeviceNet, Profibus)
- Proprietary PLC networks (examples: A-B Data Highway, Genius I/O, Modbus Plus)

Cutler-Hammer does not recommend any specific communications option. Your choice should be based on the requirements of your total control system. The communications option you choose determines the precautions you need to take when installing and connecting your PanelMate Power Series unit.

For easy reference, this chapter contains a summary of seven popular communication interface options. Each summary provides specific recommendations, guidelines and installation tips.

Note: Low signal level conductors (Category 2) have a low tolerance for induced electrical noise. Electrical noise can cause a wide range of communications problems resulting in slow or error-prone PanelMate operation. Be certain to follow all of the installation recommendations for the communication option you choose. Also, be sure to follow good wiring placement practices as outlined in **Chapter 4: Cable Segregation and Placement**.

Recommended Distance

Up to 50 feet

Recommended Cable Type/Size

24 gauge, shielded pair

RS-232 Communications

RS-232 Grounding Recommendations

Grounding of the communication cable shield at both ends will provide the most immunity to high frequency electrical interference. However, the introduction of low frequency interference by high ground currents in the shield may require grounding only one end. Should this approach result in unacceptable high frequency interference, then an RS-422 interface should be considered. For RS-232 communications, the maximum rated input voltage at the PanelMate unit's serial port is –30 to +30V.

RS-232 Shielding Recommendations

***Application:* Short or Long Runs in LOW or HIGH Noise Environment with INSIGNIFICANT Levels of Low Frequency Ground Differential Voltage Between Connected Units**

A good quality shielded cable consisting of twisted pairs for the required communication wires and logic common is recommended. An unshielded line is not recommended because the unshielded connectors may act as an antenna resulting in radiated emissions that may exceed the CE required limit. Additionally, shielded cable provides greater ESD protection. The shield should be connected directly to the chassis of the interconnected units at both ends. The connector housing should contact the cable shield uniformly around the entire 360-degree periphery of the housing cable entry opening. Never connect the shield by way of a drain wire pigtail unless absolutely necessary. If a pigtail is required, the shield should be terminated as close as possible to the connector to minimize the pigtail length.

***Application:* Short or Long Runs in LOW Noise Environment with HIGH Levels of Low Frequency Ground Differential Voltage Between Connected Units**

A good quality shielded cable consisting of twisted pairs for the required communication wires and logic common is recommended. The shield should be connected directly to the chassis of one of the interconnected units (one end only). Never connect the shield by way of a drain wire pigtail unless absolutely necessary. If a pigtail is required, the shield should be terminated as close as possible to the connector to minimize the pigtail length.

***Application:* Short or Long Runs in HIGH Noise Environment with HIGH Levels of Low Frequency Ground Differential Voltage Between Connected Units**

A good quality shielded cable consisting of twisted pairs for the required communication wires and logic common is recommended. The shield should be connected directly to the chassis of one of the interconnected units and ac-coupled through a 0.01 μf capacitor at the other end to the chassis of the second unit. The connector housing should contact the cable shield uniformly around the entire 360-degree periphery of the housing cable entry opening. Attaching the capacitor at the ac-coupled end will require some ingenuity to achieve a secure connection at both the shield and chassis while keeping the capacitor lead length as short as possible.

Recommended Distance

Up to 4000 feet

Up to 2000 feet for RS-422 connected to A-B Channel 0

Recommended Cable Type/Size

22 gauge, shielded pair

RS-422 Communications

RS-422 Grounding Recommendations

This balanced interface will operate with common mode DC or peak AC voltages differentials of –7 to +7 volts between grounds at each end of the cable. In cases where the common mode voltage approaches either extreme, the system may operate properly when the shield is grounded at only one end of the cable. However, this arrangement will make the system susceptible to high frequency interference. If the systems will not operate properly due to high frequency interference and grounding the cable shield at both ends is ineffective, then total isolation must be considered or eliminate ground potentials in your plant.

RS-422 Shielding Recommendations

Application: ***Short or Long Runs in LOW or HIGH Noise Environment with INSIGNIFICANT Levels of Low Frequency Ground Differential Voltage Between Connected Units***

A good quality shielded cable consisting of twisted pairs for the required communication wires and logic common is recommended. An unshielded line is not recommended because the unshielded connectors may act as an antenna resulting in radiated emissions that may exceed the CE required limit. Additionally, shielded cable provides greater ESD protection. The shield should be connected directly to the chassis of the interconnected units at both ends. The connector housing should contact the cable shield uniformly around the entire 360-degree periphery of the housing cable entry opening. Never connect the shield by way of a drain wire pigtail unless absolutely necessary. If a pigtail is required, the shield should be terminated as close as possible to the connector to minimize the pigtail length.

Application: ***Short or Long Runs in LOW Noise Environment with HIGH Levels of Low Frequency Ground Differential Voltage Between Connected Units***

A good quality shielded cable consisting of twisted pairs for the required communication wires and logic common is recommended. The shield should be connected directly to the chassis of one of the interconnected units (one end only). Never connect the shield by way of a drain wire pigtail unless absolutely necessary. If a pigtail is required, the shield should be terminated as close as possible to the connector to minimize the pigtail length.

Application: ***Short or Long Runs in HIGH Noise Environment with HIGH Levels of Low Frequency Ground Differential Voltage Between Connected Units***

A good quality shielded cable consisting of twisted pairs for the required communication wires and logic common is recommended. The shield should be connected directly to the chassis of one of the interconnected units and ac coupled through a 0.01 μf capacitor at the other end to the chassis of the second unit. The connector housing should contact the cable shield uniformly around the entire 360-degree periphery of the housing cable entry opening. Attaching the capacitor at the ac-coupled end will require some ingenuity to achieve a secure connection at both the shield and chassis while keeping the capacitor lead length as short as possible.

Note: When using RS-422 communications, it may be necessary to modify your communications wiring when replacing an existing PanelMate operator station with a new unit. Refer to **Chapter 5: Replacing Existing PanelMate Units** for additional information.

Recommended Distance

Up to 4000 feet

Up to 2000 feet for RS-485 connected to A-B Channel 0

Recommended Cable Type/Size

22 gauge, shielded pair

Note: See separate section for Allen-Bradley DH-485 Communications

RS-485 Multi-Drop Communications

This network is an extension of RS-422 and is used for the distribution of data between multiple system components and peripherals over distances up to 4000'. This system will tolerate common mode voltage differentials from –7 to +12 volts. For more information refer to the EIA RS-485 Standard.

RS-485 Shielding Recommendations

Application: ***Short or Long Runs in LOW or HIGH Noise Environment with INSIGNIFICANT Levels of Low Frequency Ground Differential Voltage Between Connected Units***

A good quality shielded cable consisting of twisted pairs for the required communication wires and logic common is recommended. An unshielded line is not recommended because the unshielded connectors may act as an antenna resulting in radiated emissions that may exceed the CE required limit. Additionally, shielded cable provides greater ESD protection. The shield should be connected directly to the chassis of the interconnected units at both ends. The connector housing should contact the cable shield uniformly around the entire 360-degree periphery of the housing cable entry opening. Never connect the shield by way of a drain wire pigtail unless absolutely necessary. If a pigtail is required, the shield should be terminated as close as possible to the connector to minimize the pigtail length.

Application: ***Short or Long Runs in LOW Noise Environment with HIGH Levels of Low Frequency Ground Differential Voltage Between Connected Units***

A good quality shielded cable consisting of twisted pairs for the required communication wires and logic common is recommended. The shield should be connected directly to the chassis of one of the interconnected units (one end only). Never connect the shield by way of a drain wire pigtail unless absolutely necessary. If a pigtail is required, the shield should be terminated as close as possible to the connector to minimize the pigtail length.

Application: ***Short or Long Runs in HIGH Noise Environment with HIGH Levels of Low Frequency Ground Differential Voltage Between Connected Units***

A good quality shielded cable consisting of twisted pairs for the required communication wires and logic common is recommended. The shield should be connected directly to the chassis of one of the interconnected units and ac coupled through a 0.01 μf capacitor at the other end to the chassis of the second unit. The connector housing should contact the cable shield uniformly around the entire 360-degree periphery of the housing cable entry opening. Attaching the capacitor at the ac-coupled end will require some ingenuity to achieve a secure connection at both the shield and chassis while keeping the capacitor lead length as short as possible.

Note: When using RS-485 communications, it may be necessary to modify your communications wiring when replacing an existing PanelMate operator station with a new unit. Refer to **Chapter 5: Replacing Existing PanelMate Units** for additional information.

Recommended Distance

Up to 4000 feet

Recommended Cable Type/Size

Belden 9842 cable

Allen-Bradley DH-485 Communications

Refer to your Allen-Bradley Cable Installation manual for detailed information. The following tips are useful when installing a PanelMate on A-B DH-485 communication networks:

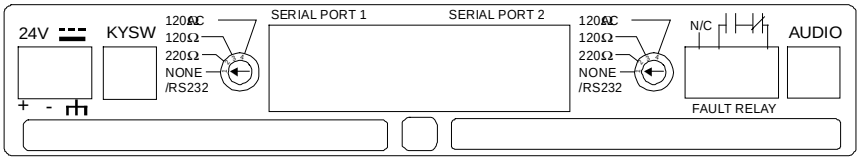
Tip #1: All PanelMate units on the A-B DH-485 communications network should have optical isolation to prevent serial port damage. If the PanelMate model you are installing DOES NOT have built-in optical isolation, then an Allen-Bradley AIC module should be used to provide optical isolation. See **Replacing Existing PanelMate Units Using R422/485 Communications** for specific PanelMate model optical isolation information.

Tip #2: Verify the network is terminated. Both ends of a DH-485 network must contain termination resistors. PanelMate Power Series units have built in termination resistors that can be activated if needed.

PanelMate Power Series 1500: on the RJ-45 connector, jumping pins 7 and 8 activates 120-Ohm AC termination

All 120VAC PanelMate Power Series Models: Jumpers on the processor board terminate the serial port. Jumper “JP1” for serial port 1 must be set in position A for 120 Ohm termination

All 24VDC PanelMate Power Series Models (except 1500): An external switch is located on the bottom of the unit.



Note: When using A-B DH-485 communications, it may be necessary to modify your communications wiring when replacing an existing PanelMate operator station with a new unit. Refer to **Chapter 5: Replacing Existing PanelMate Units** for additional information.

Recommended Distance

Up to 10,000 feet at 57.6Kbaud. Shorter lengths at higher baud rates

Recommended Cable Type/Size

Belden 9463 “blue hose” twinaxial cable

Allen-Bradley Data Highway/Data Highway Plus Communications

Data Highway and Data Highway Plus are proprietary communication networks of Allen-Bradley. Generally, the structure and components of the two networks are the same, but there are differences in communications protocols. Refer to your Allen-Bradley Cable Installation Manual for detailed information.

The following tips are useful when installing a PanelMate on A-B Data Highway and Data Highway Plus communication networks:

Tip #1: Verify the network is terminated. Both ends of an A-B Data Highway/Data Highway Plus network must contain termination resistors. Resistor value is determined by the network baud rate. The resistor value must be the same at both ends of the network:

57.6 K, 115.2K	150 or 82.5 Ohm
230.4K	82.5 Ohm

Tip #2: The minimum cable length is 20’ between any two nodes.

Tip #3: On Data Highway Plus networks, daisy chained networks are preferred, but trunkline/drop line is acceptable. Star or tree configurations are **NOT** acceptable.

Tip #4: In order to comply with CE Mark requirements, ferrite cores must be installed on the PanelMate unit’s AcceleratI/On cable. Steward number 28B0735-000 is recommended. Refer to Cutler-Hammer’s PanelMate AcceleratI/On Interface Installation I.L. for installation details.

Recommended Distance

Up to 10,000 feet at 57.6Kbaud. Shorter lengths at higher baud rates

Recommended Cable Type/Size

PVC Twinaxial cable

Allen-Bradley Remote I/O Link Communications

The Remote I/O Link is a proprietary communication network of Allen-Bradley. The following tips are useful when installing a PanelMate on Remote I/O Link networks:

Tip #1: Verify the network is terminated. Both ends of an A-B Remote I/O Link network must be terminated. Resistor value is determined by the network baud rate. The resistor value must be the same at both ends of the network:

57.6 K, 115.2K	150 or 82.5 Ohm
230.4K	82.5 Ohm

Tip #2: On Remote I/O networks, daisy chained networks are preferred, but trunkline/drop line is acceptable. Star or tree configurations are **NOT** acceptable.

Tip #3: All devices connected to the Remote I/O Link must communicate at the same baud rate.

Recommended Distance

Up to 7500 feet at 38.4Kbaud. Shorter lengths at higher baud rates

Recommended Cable Type/Size

Refer to your GE Fanuc Automation Genius I/O Systems and Communications User's Manual

GE Fanuc Genius I/O Communications

This proprietary communications network uses twisted pair shielded cable and/or fiber optics cable. For detailed installation instructions refer to the GE Fanuc Automation Genius I/O Systems and Communications User's Manual. The following tips are useful when installing a PanelMate on Genius I/O communication networks:

Tip #1: If the PanelMate unit is located at an end of the network, termination is required. The termination resistor value is dependent on the type of cable used. Consult your Genius I/O manual for exact requirements.

Tip #2: Cable type, baud rate and cable length must all be compatible and determine the maximum number of nodes allowed on the network.

Tip #3: Shield Out and Shield In connections must be daisy chained, with the first device's Shield In terminal and the last device's Shield Out terminal left unconnected.

Tip #4: In high electrical noise installations, 153.6Kbaud provides better noise immunity.

Recommended Distance

Up to 7500 feet at 38.4Kbaud. Shorter lengths at higher baud rates

Recommended Cable Type/Size

Refer to your GE Fanuc Automation Modicon Modbus Plus Network Planning and Installation Guide

Modicon Modbus Plus Communications

This proprietary communications network consists of twisted pair shielded cable extending up to 1500 feet with up to 32 nodes. For detailed installation instructions refer to your Modicon Modbus Plus Network Planning and Installation Guide. The following tips are useful when installing a PanelMate on Modicon Modbus Plus communication networks:

Tip #1: Trunkline/drop line is the only acceptable network configuration. Star or tree configurations are NOT acceptable.

Tip #2: A drop cable is used to connect the PanelMate unit to the trunk line tap. The drop cable is equipped with a ground lug that must be connected to PanelMate unit's panel ground.

Tip #3: The minimum cable length between nodes must be at least 10'.

Recommended Distance

Up to 1640 feet at 125Kbaud

Recommended Cable Type/Size

Refer to your Cutler-Hammer DeviceNet Installation Guide

DeviceNet Communications

DeviceNet is a non-proprietary communications network consisting of 5 conductor, shielded cable in trunk line (thick) and drop line (thin) styles. Up to 64 nodes can be installed on the network. Refer to Cutler-Hammer's DeviceNet Planning and Installation Guide for detailed information on DeviceNet networks. The following tips are useful when installing a PanelMate on a DeviceNet communication network:

Tip #1: The drop line to the PanelMate unit must not exceed 20'.

Tip #2: If the PanelMate unit is the last node on the network, termination is required. Install a 120 Ohm terminator in the unused plug of the connector, or install a 120 Ohm resistor between pins 4 and 2 of the Phoenix connector.

Tip #3: The PanelMate unit does not draw power from, or supply power to the network. It is not necessary to make the V+ connection, but you should do so to secure the wires and prevent shorting.

Tip #4: In all PanelMate units, the DeviceNet signal ground is isolated from chassis ground. In locations where problems are caused by high electrical noise, you can change the jumper setting on the PanelMate unit's DeviceNet communications card to connect signal ground to chassis ground. Refer to Cutler-Hammer's PanelMate DeviceNet Interface Installation I.L. for detailed jumper information.

Tip #5: In order to comply with CE Mark requirements, ferrite cores must be installed on the PanelMate unit's drop line. Steward number 28B1020-100 is recommended for thick line installations. Steward number 28B0735-000 is recommended for thin line installations. Refer to Cutler-Hammer's PanelMate DeviceNet Interface Installation I.L. for installation details.

Recommended Distance

Up to 3278 feet at 93.7Kbaud

Recommended Cable Type/Size

22 gauge, shielded pair

Profibus DP Communications

Profibus DP is based on RS-485 network technology. A Profibus DP network may have up to 126 nodes, but maximum length of the network is determined by baud rate.

Profibus DP Shielding Recommendations

A good quality shielded cable consisting of twisted pairs for the required communication wires and logic common is recommended. An unshielded line is not recommended because the unshielded connectors may act as an antenna resulting in radiated emissions that may exceed the CE required limit. Additionally, shielded cable provides greater ESD protection. The shield should be connected directly to the chassis of the interconnected units at both ends. The connector housing should contact the cable shield uniformly around the entire 360-degree periphery of the housing cable entry opening. Never connect the shield by way of a drain wire pigtail unless absolutely necessary. If a pigtail is required, the shield should be terminated as close as possible to the connector to minimize the pigtail length.

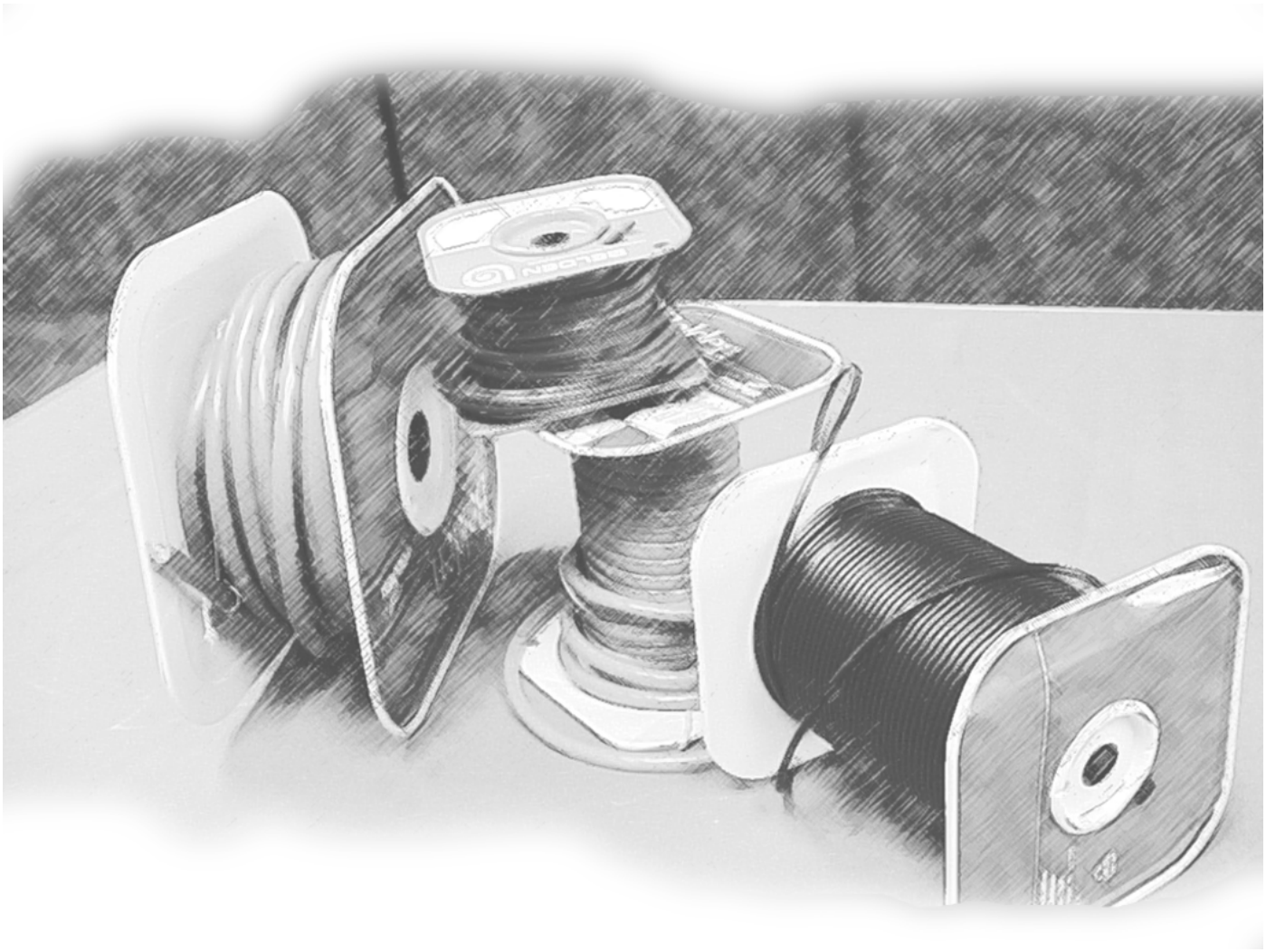
Using PanelMate on a Profibus DP network

The following tips are useful when installing a PanelMate on a Profibus DP communication network:

Tip #1: The Profibus network must be terminated at both ends of every segment. The termination must be powered at all times.

Tip #2: As the Profibus DP network allows daisy-chained connections, wiring for Signal A and Signal B must remain consistent throughout the segment. It is suggested that the green wire is used for Signal A and the red wire is used for Signal B.

4 Cable Segregation & Placement



Chapter Overview

When planning the location and placement of wiring, care should be taken to minimize electrical noise problems. Noise is often the problem when intermittent communications problems are experienced. Loss of data, slow response and communication error messages are common indications of electrical noise contamination.

This chapter gives a brief overview of cable routing and placement issues.

Potential Problem Areas

High and low power conductors routed in the same conduit or raceway

Conduit with low power conductors routed in close parallel proximity to conduit containing high power conductors

Cable or PanelMate unit located too close to devices generating high levels of magnetic or electrical interference

Lack of continuous electrical continuity along the length of the conduit installation

Cable Segregation

The low power cabling used for PLC and PC-based control systems is very susceptible to electrical noise generated by high power conductors. Even when protected by conduit, noise can interfere with your communication lines and networks. Therefore it is important to segregate conductors according to their type.

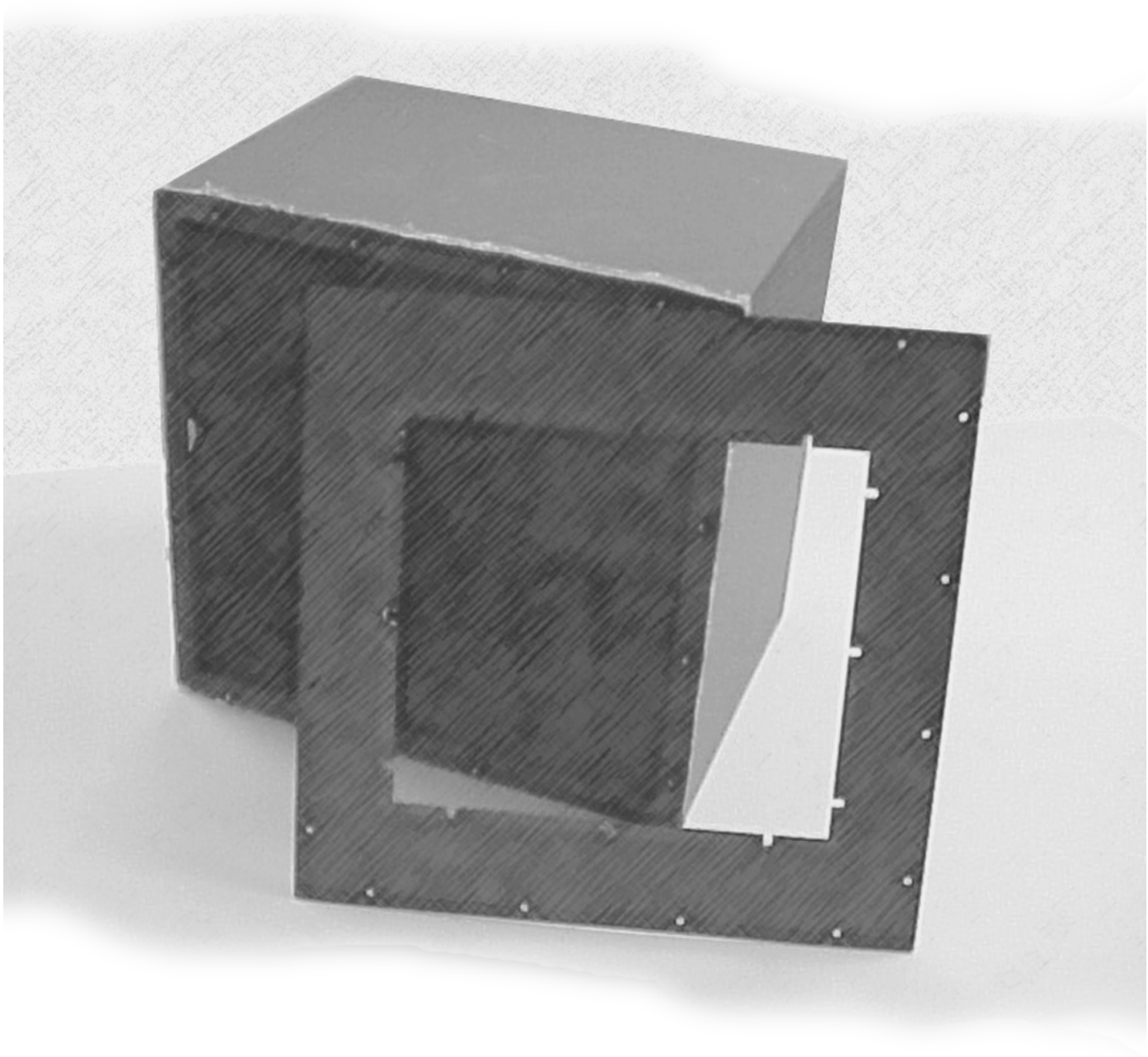
Category	Description	Examples
Category 1	High Power Conductors These conductors can cause electrical noise in Category 2 conductors when in close proximity. Are more tolerant of electrical noise than Category 2. Reference: NEC article 725 class 1 Reference IEEE level 3 and 4	AC power lines High power digital AC and DC lines Typically these conductors are used to connect hard-contact switches, relays, solenoids, motors, generators and arc welders.
Category 2	Low Signal Level Conductors These conductors are less tolerant of electrical noise, however, they cause less noise in adjacent conductors. Reference NEC article 725 class 2, class 3 Reference IEEE level 1 and level 2	Communication cables - Ethernet, PLC networks, etc. Low power digital AC and DC I/O lines Typically these conductors are used to connect PLCs and related modules with PanelMate operator stations

Cable Placement

The following guidelines should be used when installing your communication cables:

- All Category 2 cables should be shielded and routed in a separate conduit or raceway from Category 1 cables.
- Route Category 2 cables at least one foot from 120VAC power lines.
- Route Category 2 cables at least two feet from 240VAC power lines.
- Route Category 2 cables at least three feet from 480VAC power lines.
- Route Category 2 cables at least five feet from high voltage enclosures.
- If a Category 2 cable must cross Category 1 cables, it should cross at a right angle.
- If Category 2 cable is enclosed in metal conduit or a metal raceway, electrical continuity must be maintained along the entire length of the conduit/raceway installation, including entry into the enclosure.

5 Replacing an Existing PanelMate Power Series Unit



Chapter Overview

When replacing and existing PanelMate Power Series unit with a new PanelMate Power Series unit, it may be necessary to modify your installation. This chapter will help you determine if modifications are required.

Potential Problem Areas

Existing enclosure is too small for the new PanelMate unit

Different power supply requirements for the new PanelMate unit

Optically vs. non-optically isolated serial ports

Replacing a 120VAC PanelMate Power Series unit with another 120VAC PanelMate Power Series unit.

The only issue to investigate in this retrofitting is enclosure size. Be sure to confirm the expected enclosure ambient temperature with the new unit installed. The table in Chapter 2: Enclosure Sizing can help you determine the suitability of the existing enclosure. Also, confirm that the minimum free space above and below the new unit will meet the requirements for the model installed. See the table provided in Chapter 2: Enclosure Sizing.

Replacing a 120VAC PanelMate Power Series unit with a 24VDC PanelMate Power Series unit

When replacing a 120VAC unit with a 24VDC unit, there are two issues to address: The need for a 24VDC power supply, and the PLC Communications cable. The power supply issue is self-explanatory. The communications issues discussed apply to all 24VDC PanelMate Power Series models except 1500 models.

Proprietary Networks or DeviceNet Communications: These communications cables use a special connector and attach to an optional communications module or board. Since they do not use the PanelMate unit's serial ports, modifications are not necessary. Simply plug in the existing cable's connector into the new unit's optional communications module.

RS-232 Communications: An RS-232 cable is already equipped with the ground return conductor required by the 1700's optically isolated serial ports.

RS-422/485/DH-485 Communications : When connected to an optically isolated serial port, an RS-422/485/DH-485 cable must have a ground return conductor. You can approach this issue from two directions: provide a ground wire, or defeat the optical isolation on the serial ports. *Without the modifications, the new 24VDC PanelMate Power Series unit may experience unreliable communications and unexpected operational failures.*

Option #1: If the existing cable was installed without a ground conductor but contains an unused conductor, that conductor can be connected and the cable shield connection revised to conform with the noise reduction recommendations provided in Chapter 3: Communication Cable Selection, Shielding Grounding and Termination.

Option #2: Replace the existing communication cable with a new cable. Cutler-Hammer offers communications cables for these applications. Contact Cutler Hammer Support Services for additional information.

Option #3: Place a jumper in the existing cable connector between the Ground Pin (5) and the connector shell cover. This would provide the required ground reference for the new 24VDC unit, but the port would now be non-isolated. If the existing unit functioned properly with a non-isolated port, the new unit will probably work equally as well with this modification.

Upgrading a PanelMate Power Series Model 1500 unit with a PanelMate Power Series Model 1700 unit

When upgrading a Model 1500 unit to a Model 1700 unit, three issues should be reviewed: power supply, enclosure sizing, and communications cable.

Power Supply: Although both PanelMate Power Series 1500 and 1700 models operate on 24VDC, 1700 models draw additional current. Check to make sure your 24VDC power supply is adequately rated for the 1700.

Enclosure Sizing: Due to the 1700's higher current usage, it produces more BTUs of heat energy that must be dissipated by the enclosure. The table in Chapter 2: Enclosure Sizing can help you determine the suitability of the existing enclosure.

Communications Cable: Model 1700 units are equipped with optically isolated serial ports using DB-9 connectors. Model 1500 units are equipped with non-optically isolated serial ports using RJ-type connectors. These issues are addressed differently, depending on the type of communications used.

Proprietary Networks or DeviceNet Communications: These communications cables use a special connector and attach to an optional communications module. Since they do not use the 1700's serial ports, modifications are not necessary. Simply plug in the existing cable's connector into the 1700s units optional communications module

RS-232 Communications: An RS-232 cable is already equipped with the ground return conductor required by the 1700's optically isolated serial ports. Therefore, the only modification required to the cable is changing from the RJ-type connector to a DB-9 connector. An adapter is available from Cutler-Hammer, or the existing connector can be removed and replaced with a new DB-9 connector.

RS-422/485/DH-485 Communications : When connected to an optically isolated serial port, an RS-422/485/DH-485 cable must have a ground return conductor. You can approach this issue from two directions: provide a ground wire, or defeat the optically isolation on the serial ports. *Without the modifications, the new1700 unit may experience unreliable communications and unexpected operational failures.*

Option #1: If the existing cable was installed without a ground conductor but contains an unused conductor, that conductor can be connected and the cable shield connection revised to conform with the noise reduction recommendations provided in Chapter 3: Communication Cable Selection, Shielding Grounding and Termination.

If you elect to use this option, you will need to remove the existing RJ connector and replace it with a DB-9 connector.

Option #2: Replace the existing communication cable with a new cable. Cutler-Hammer offers communications cables for these applications. Contact Cutler Hammer Support Services for additional information.

Option #3: Place a jumper in the existing cable connector between the Ground Pin (5) and the connector shell cover. This would provide the required ground reference for the new 24VDC unit, but the port would now be non-isolated. If the existing unit functioned properly with a non-isolated port, the new unit will probably work equally as well with this modification.

If you elect to use this option, you will need to remove the existing RJ connector and replace it with a DB-9 connector.

Caution:

You can not simply add a DB-9 to RJ adapter when using RS-422/485/DH-485 communications. You must jumper the existing cable connector as described. Otherwise, the serial ports will remain optically isolated and you may experience unreliable communications and unexpected operational failures.

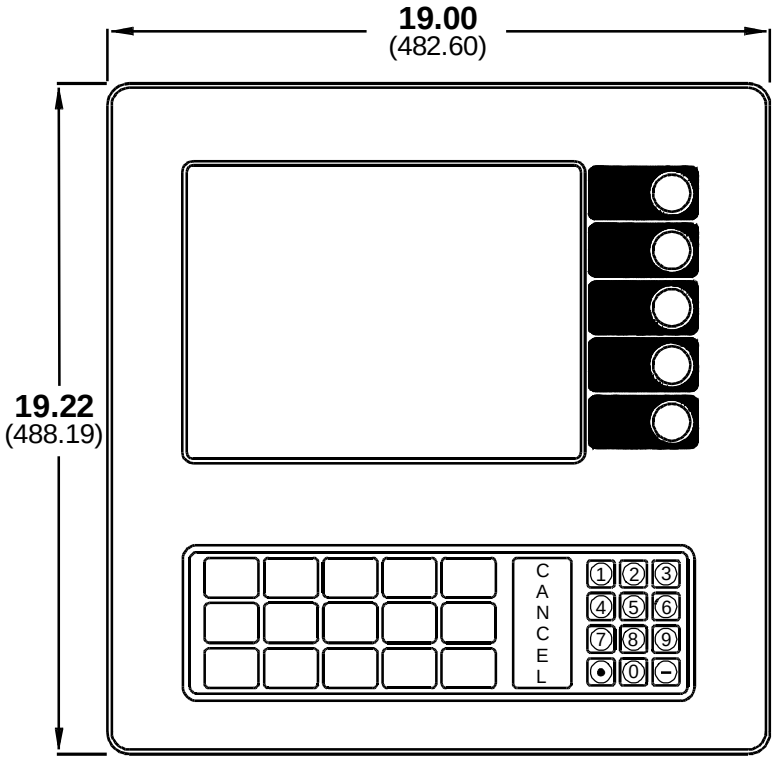
A Cutout and Unit Dimensions

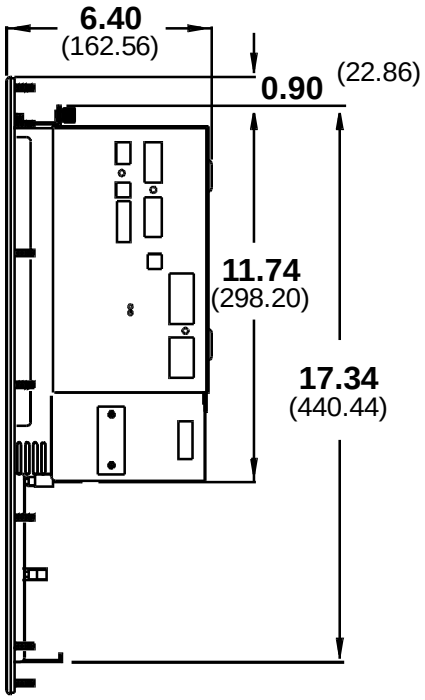
Before you begin cutting metal.....

The information in this Appendix was accurate at the time of printing. However, product dimensions and cutouts are subject to change.

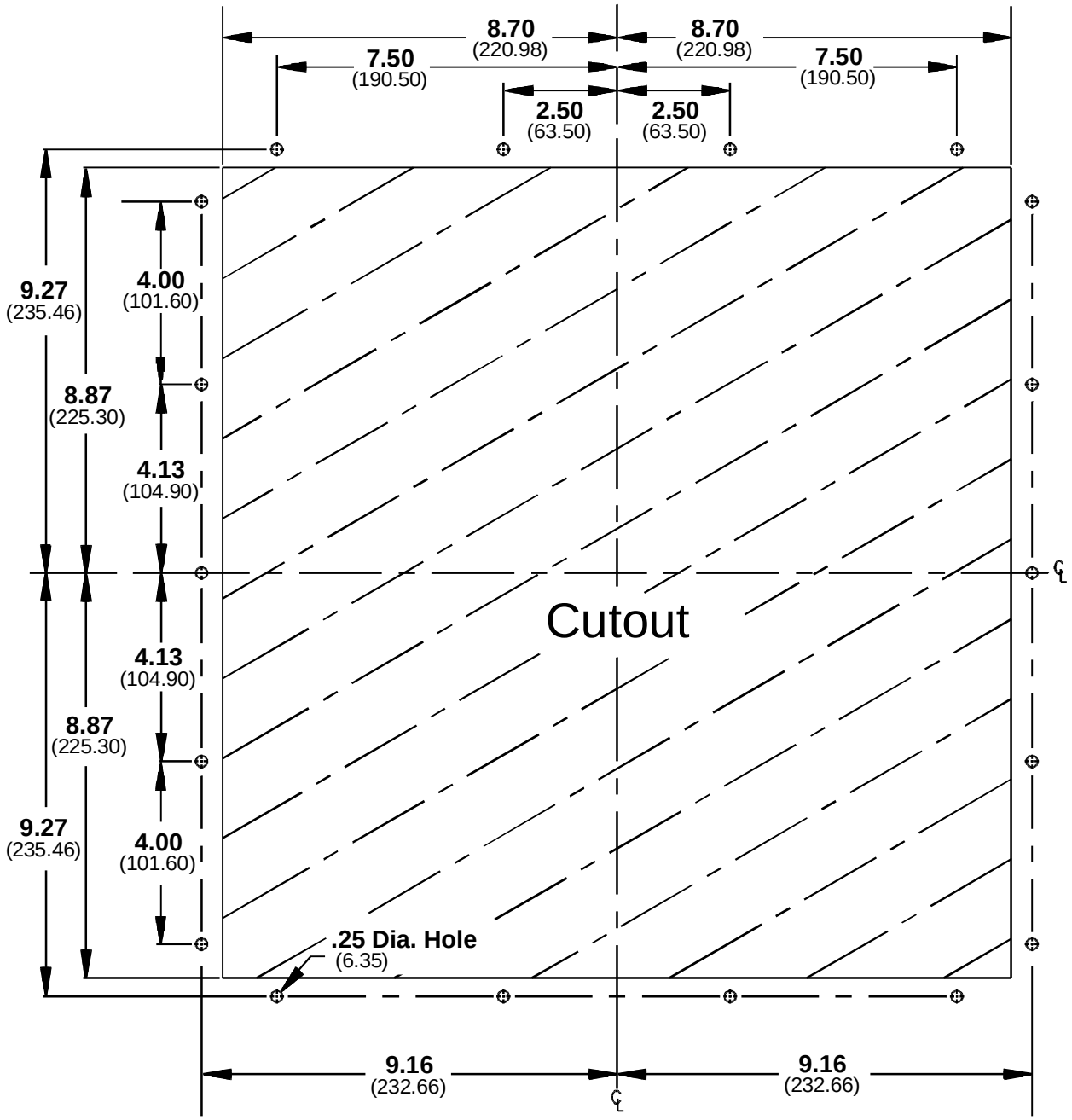
A Cutout Drawing is included with your PanelMate Power Series unit. Confirm all of your cutout dimensions with that drawing <u>prior</u> to cutting.

PanelMate 5000 Keypad Unit Dimensions

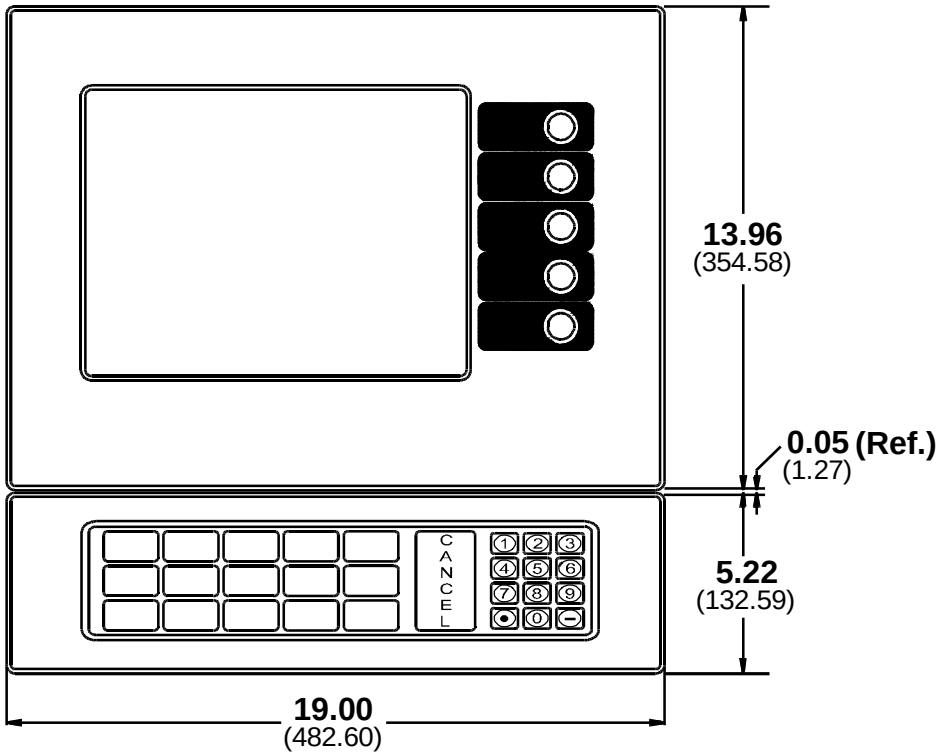


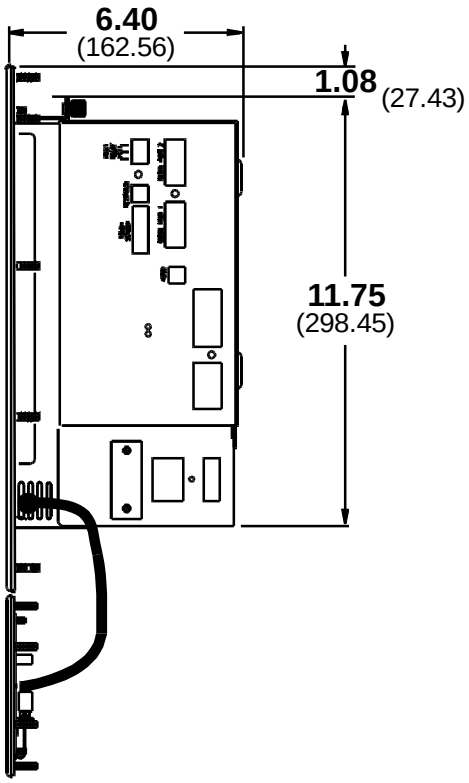


PanelMate 5000 Keyboard Cutout Dimensions

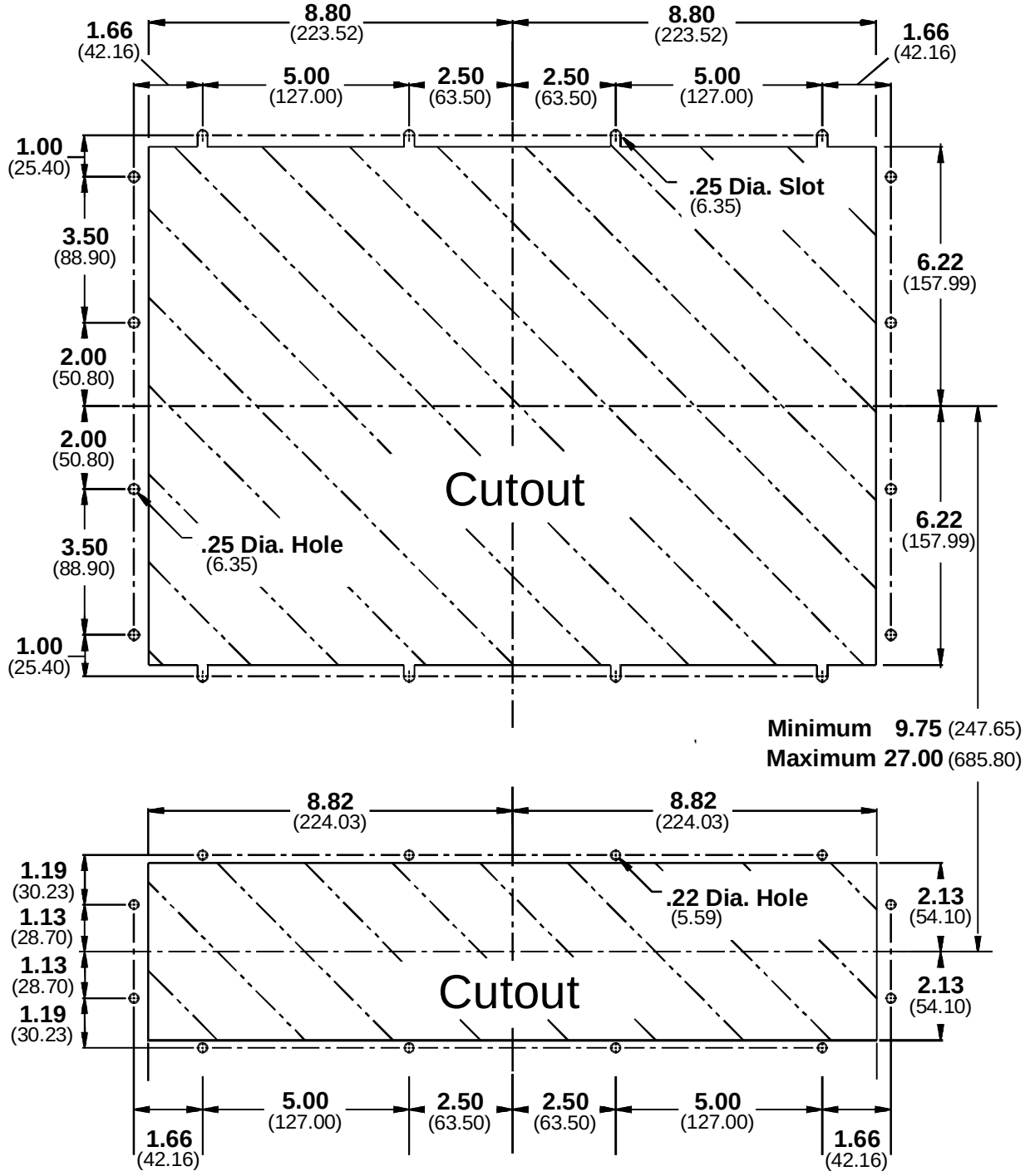


PanelMate 5000 Split Architecture Unit Dimensions

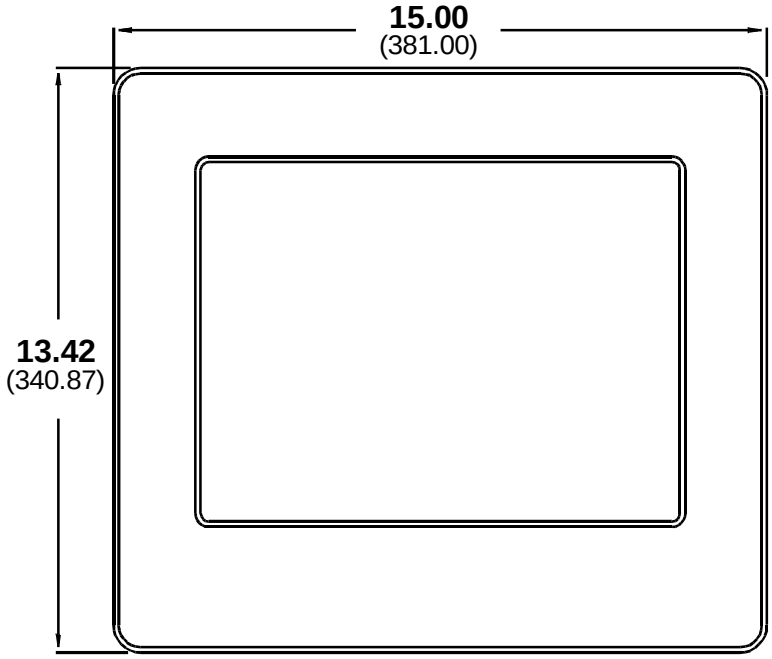


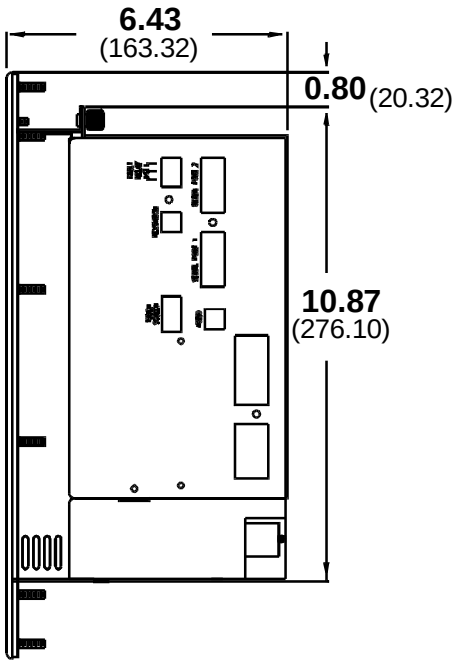


PanelMate 5000 Split Architecture Cutout Dimensions

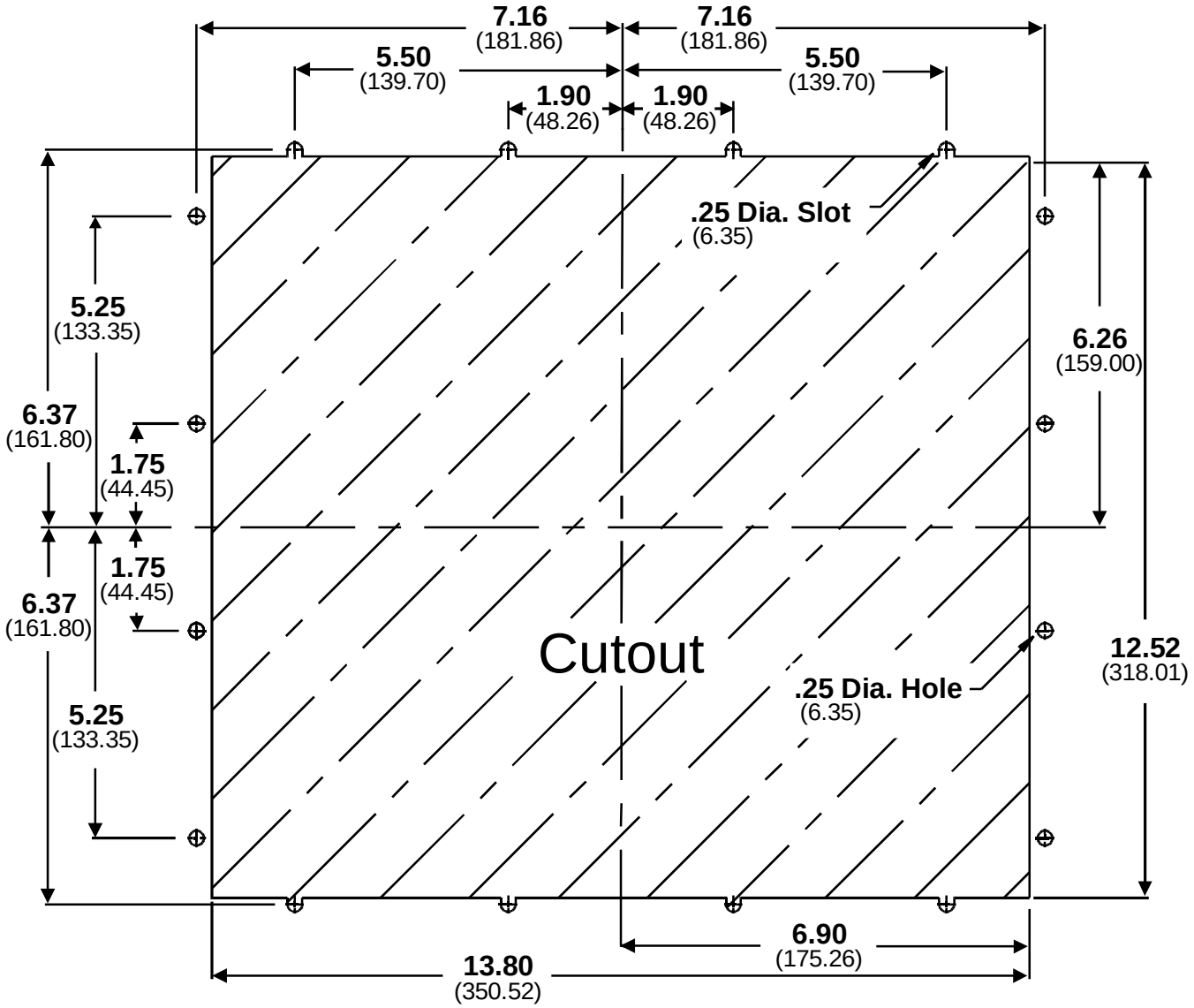


PanelMate 5000 Touchscreen Unit Dimensions

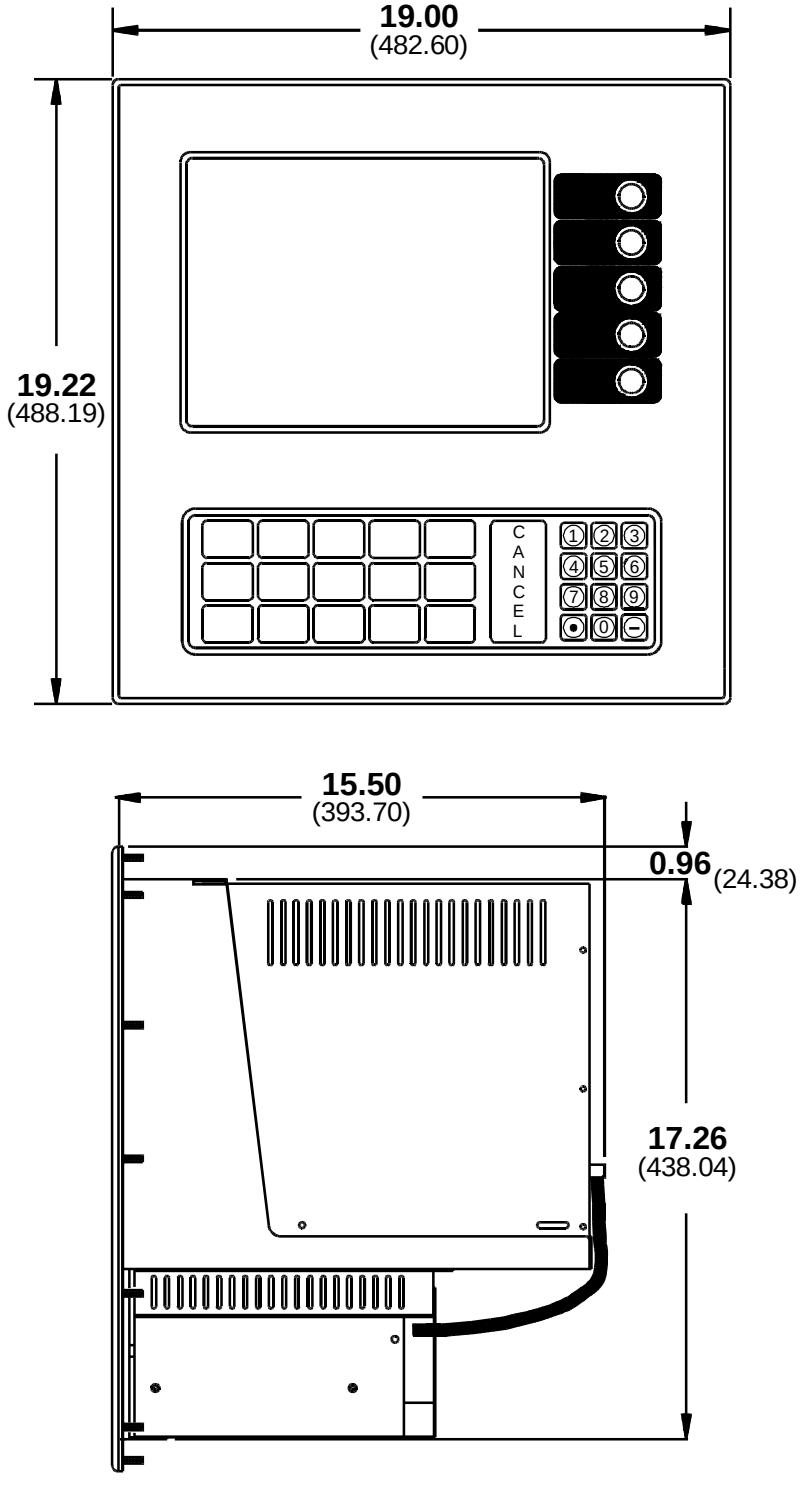




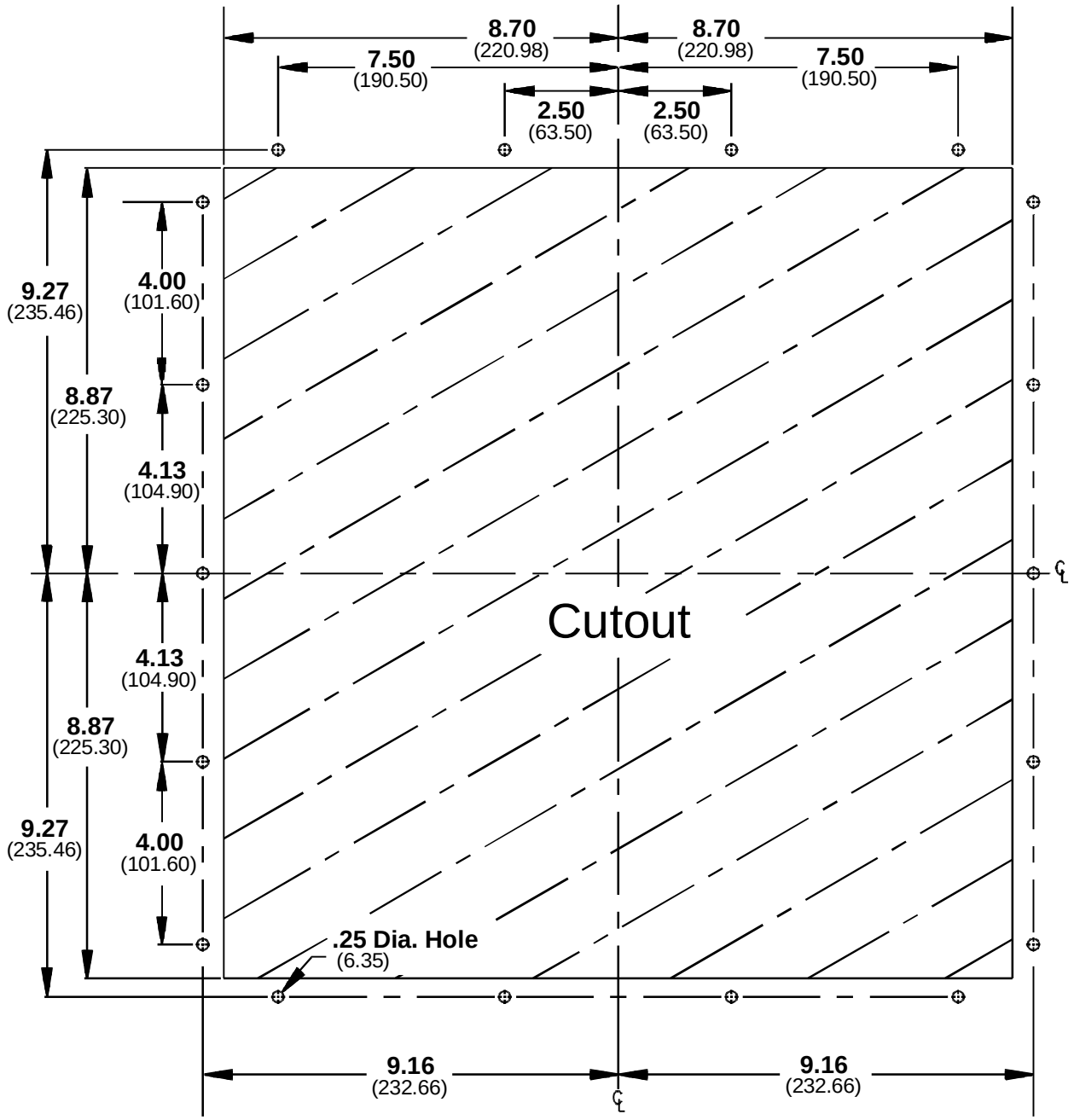
PanelMate 5000 Touchscreen Cutout Dimensions



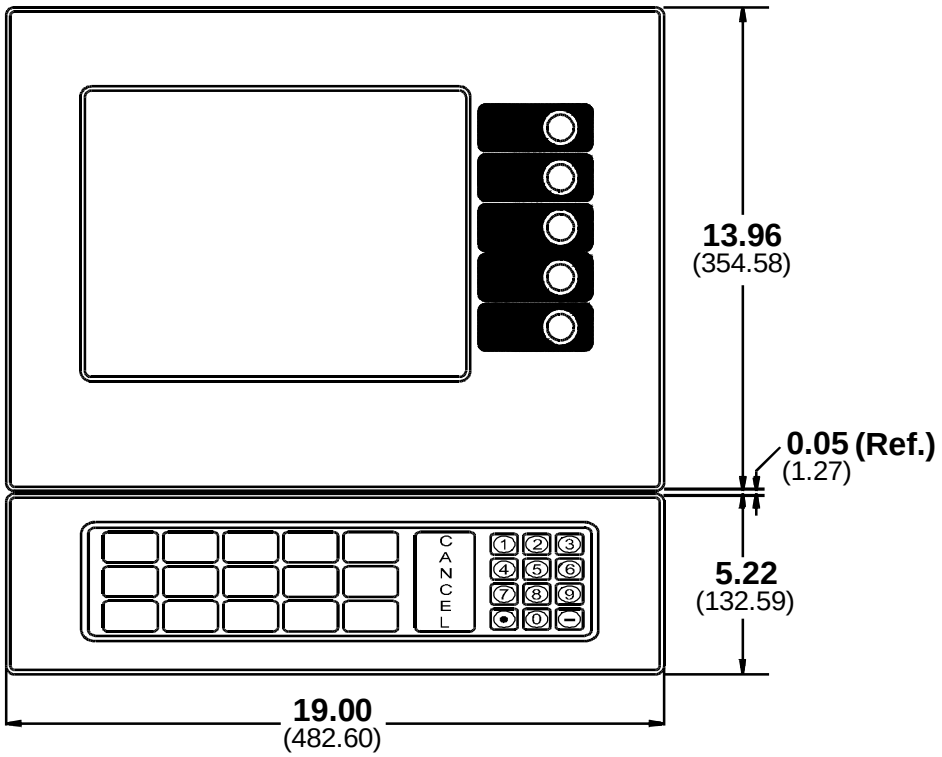
PanelMate 4000 Keypad Unit Dimensions

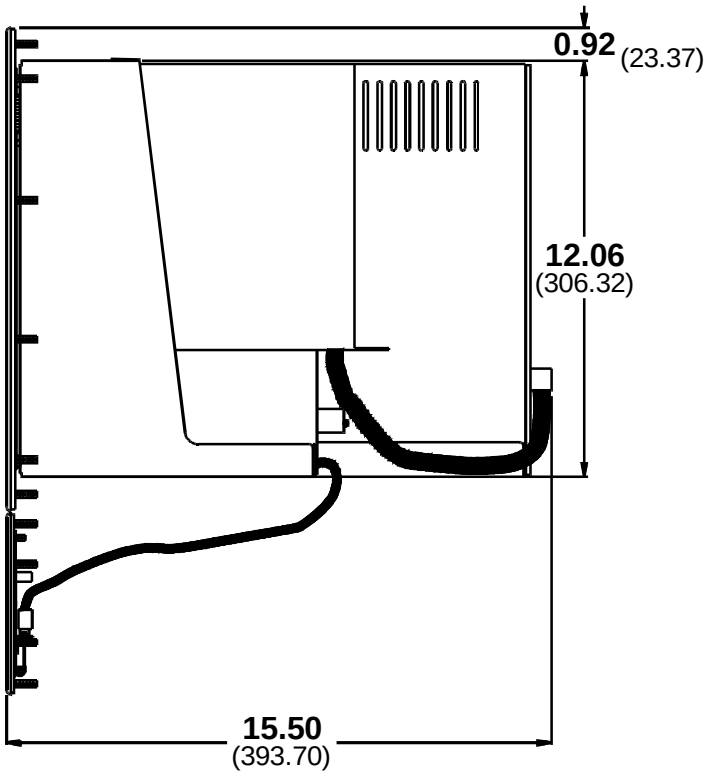


PanelMate 4000 Keypad Cutout Dimensions

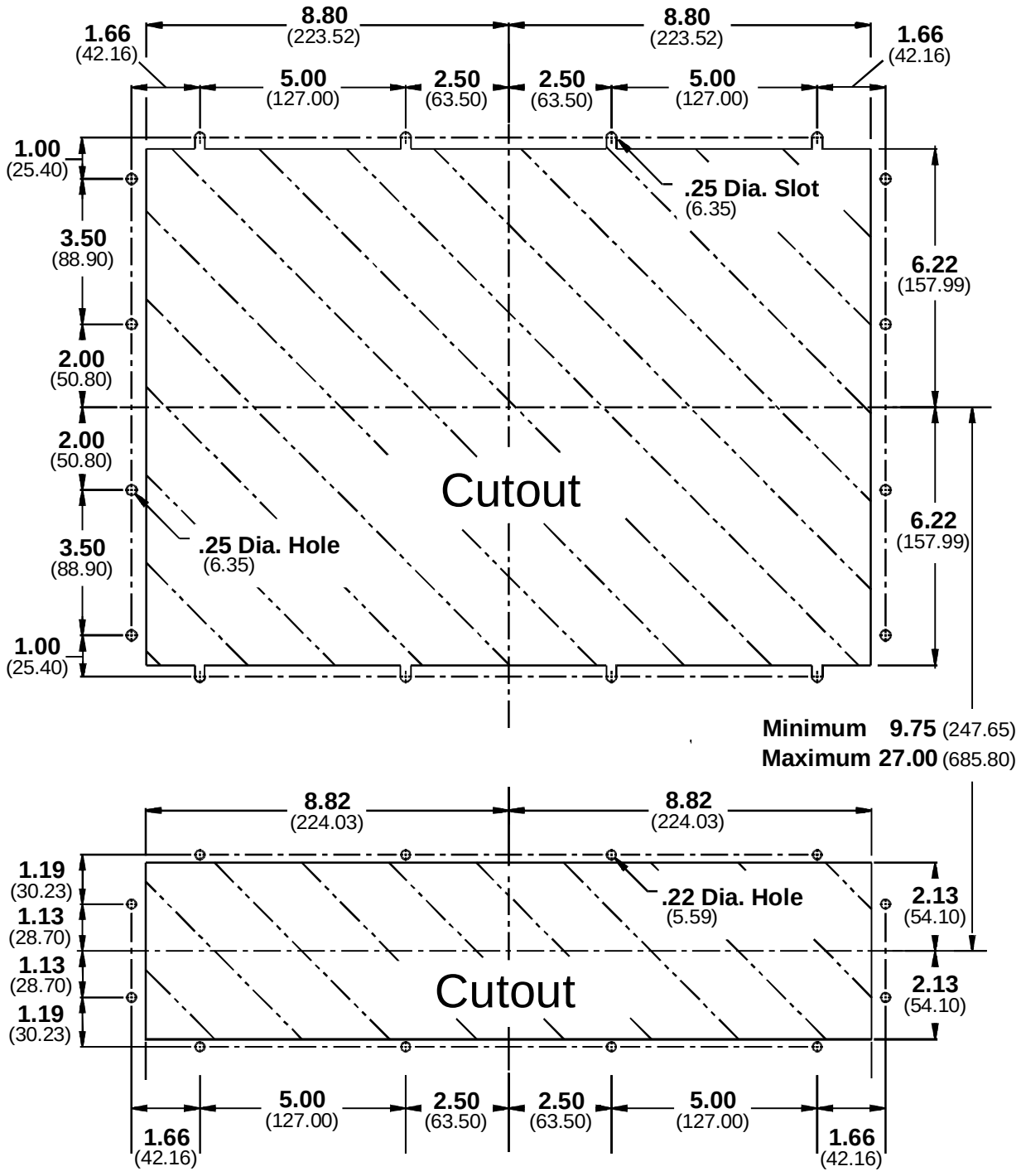


PanelMate 4000 Split Architecture Unit Dimensions

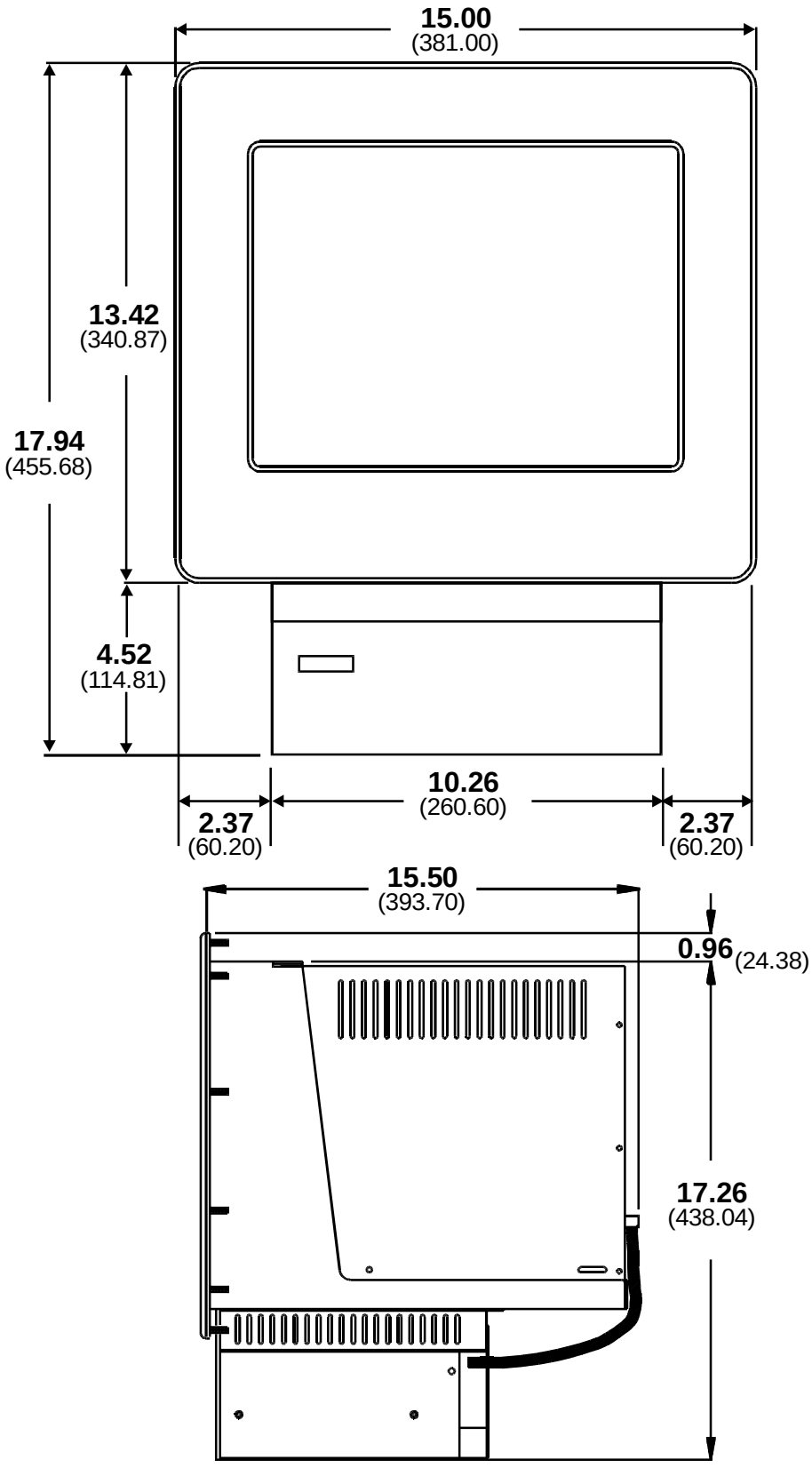




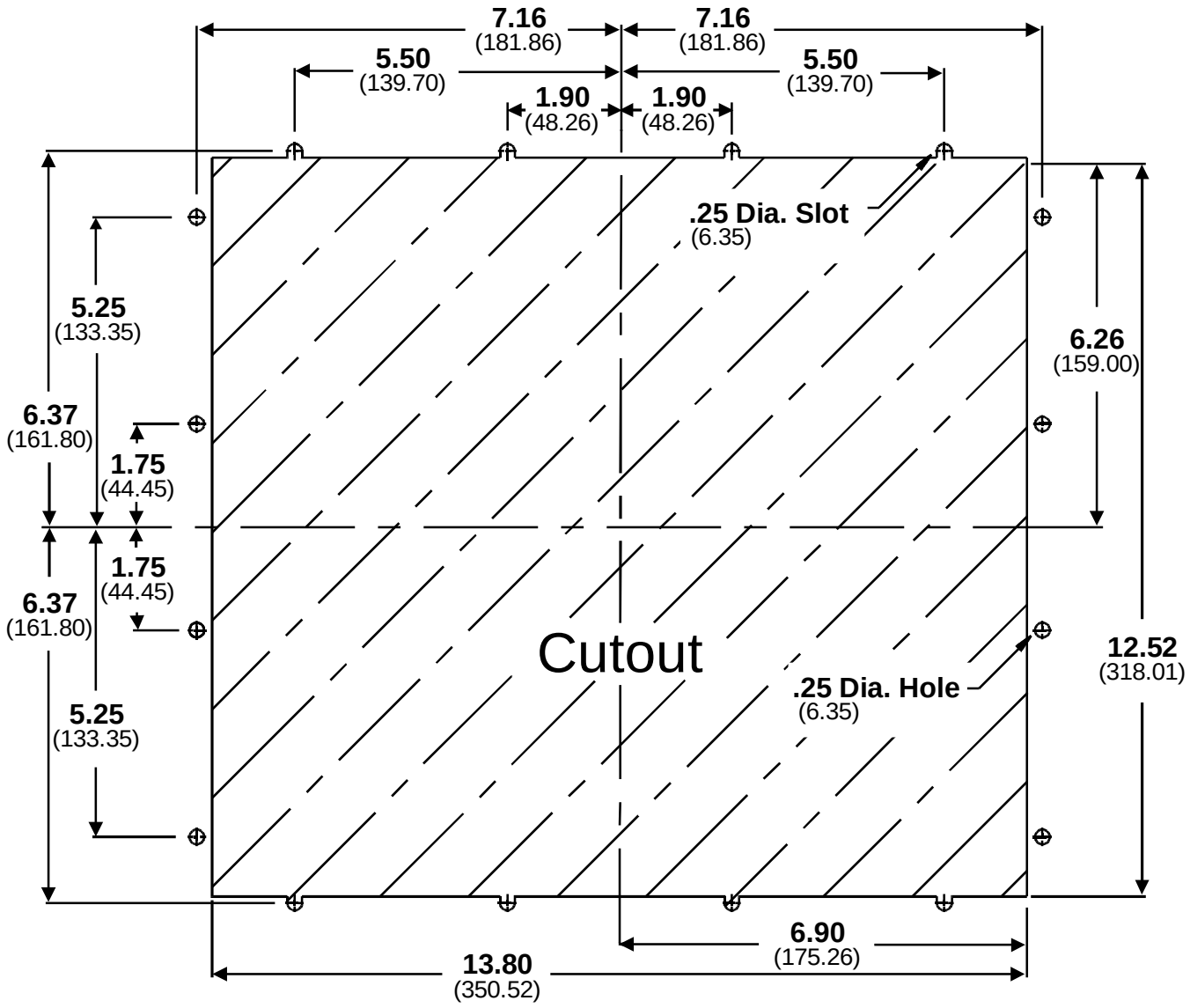
PanelMate 4000 Split Architecture Cutout Dimensions



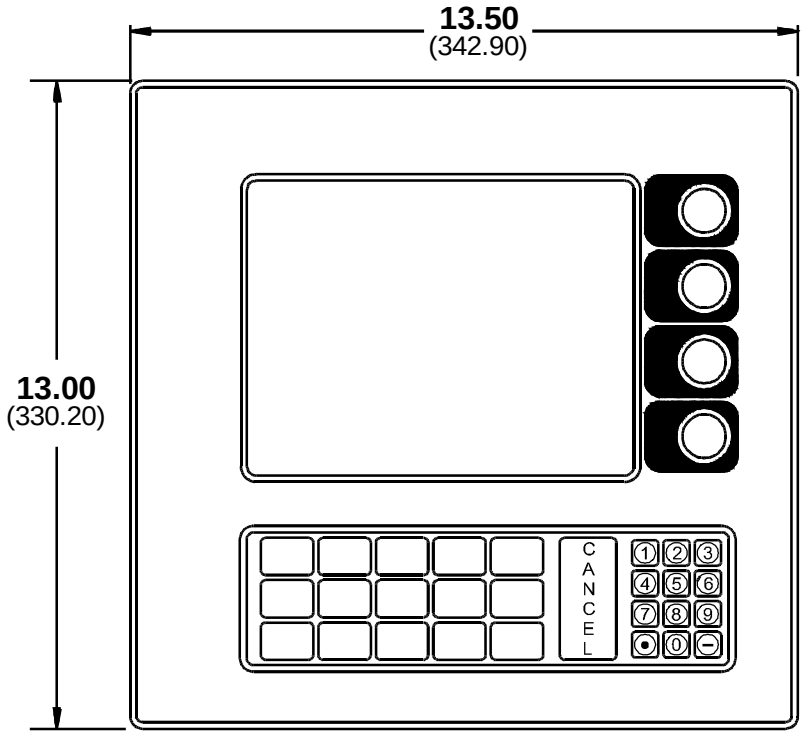
PanelMate 4000 Touchscreen Unit Dimensions

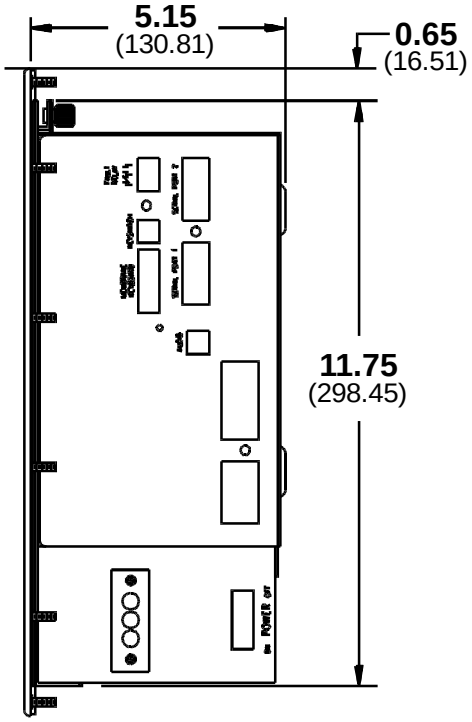


PanelMate 4000 Touchscreen Cutout Dimensions

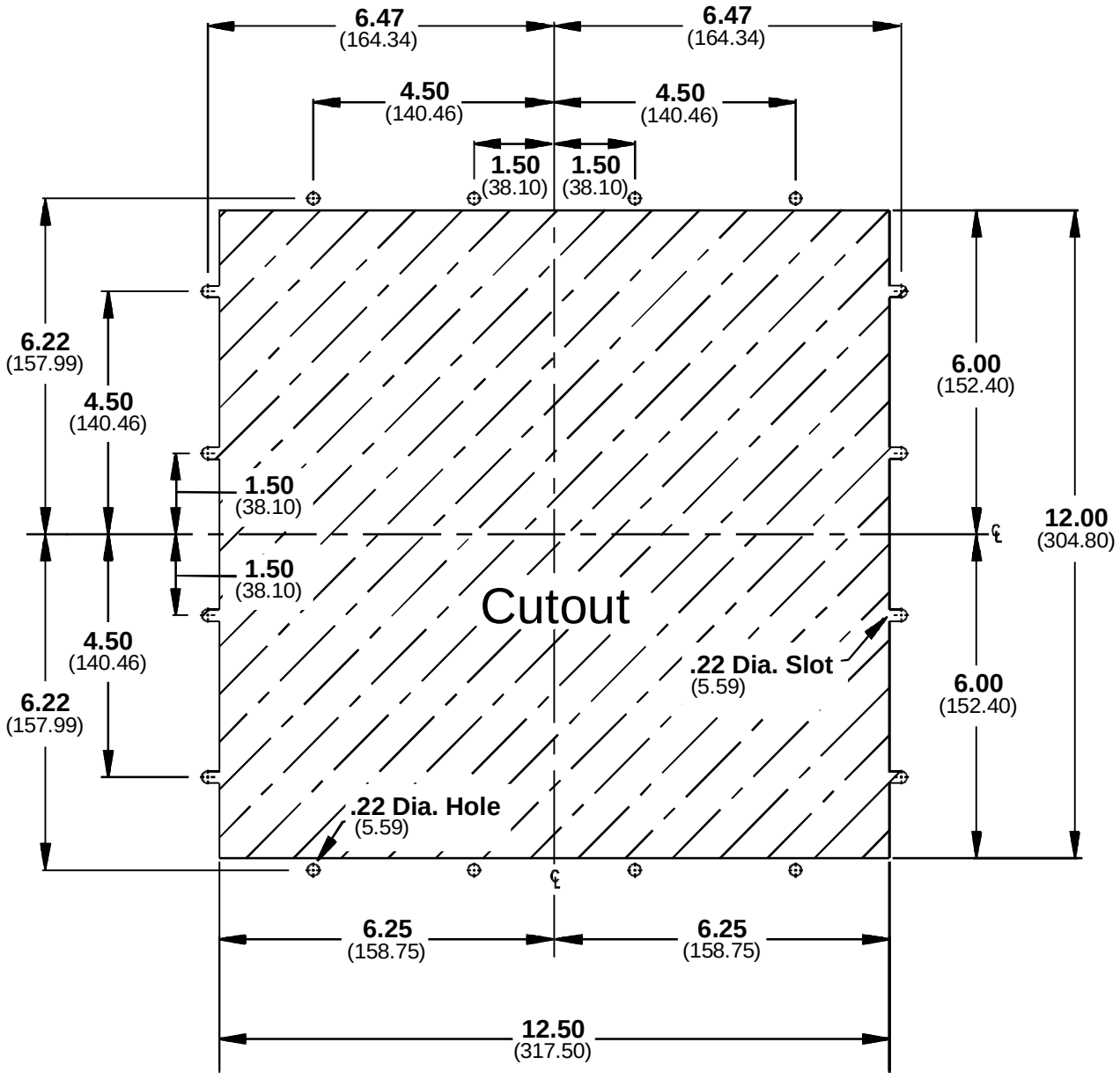


PanelMate 3000 Keyboard Unit Dimensions

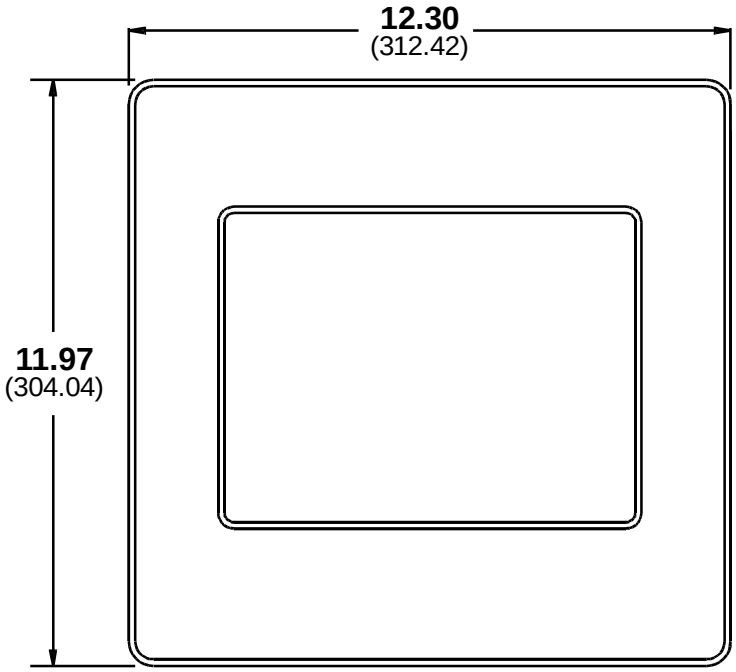


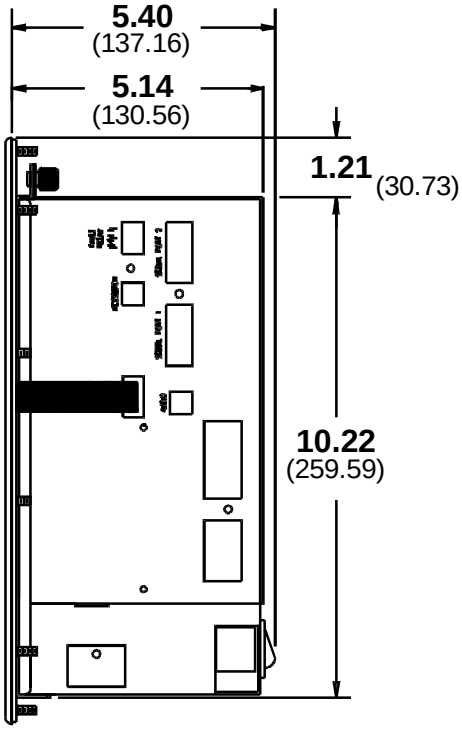


PanelMate 3000 Keypad Cutout Dimensions

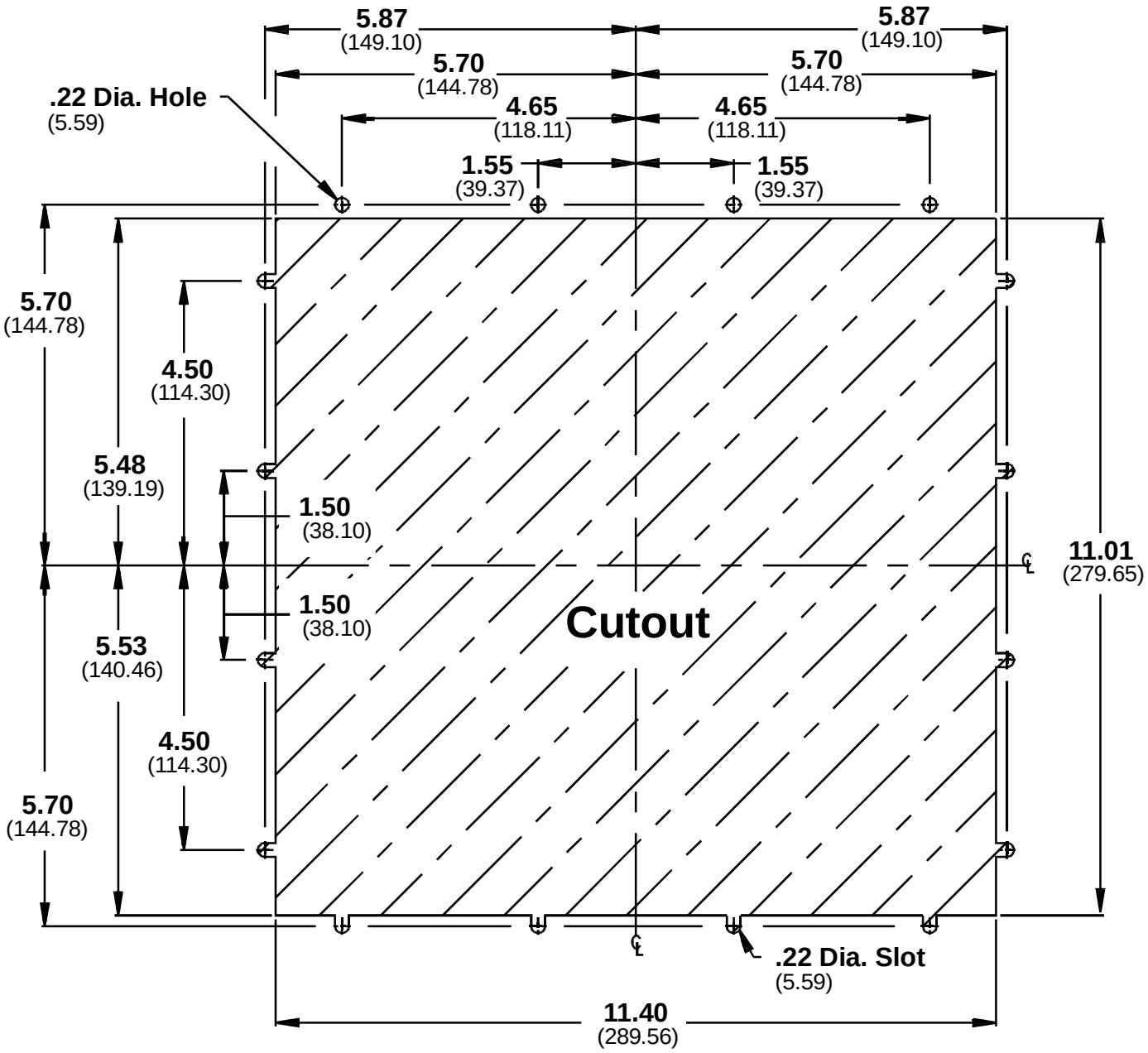


PanelMate 3000 Touchscreen Unit Dimensions

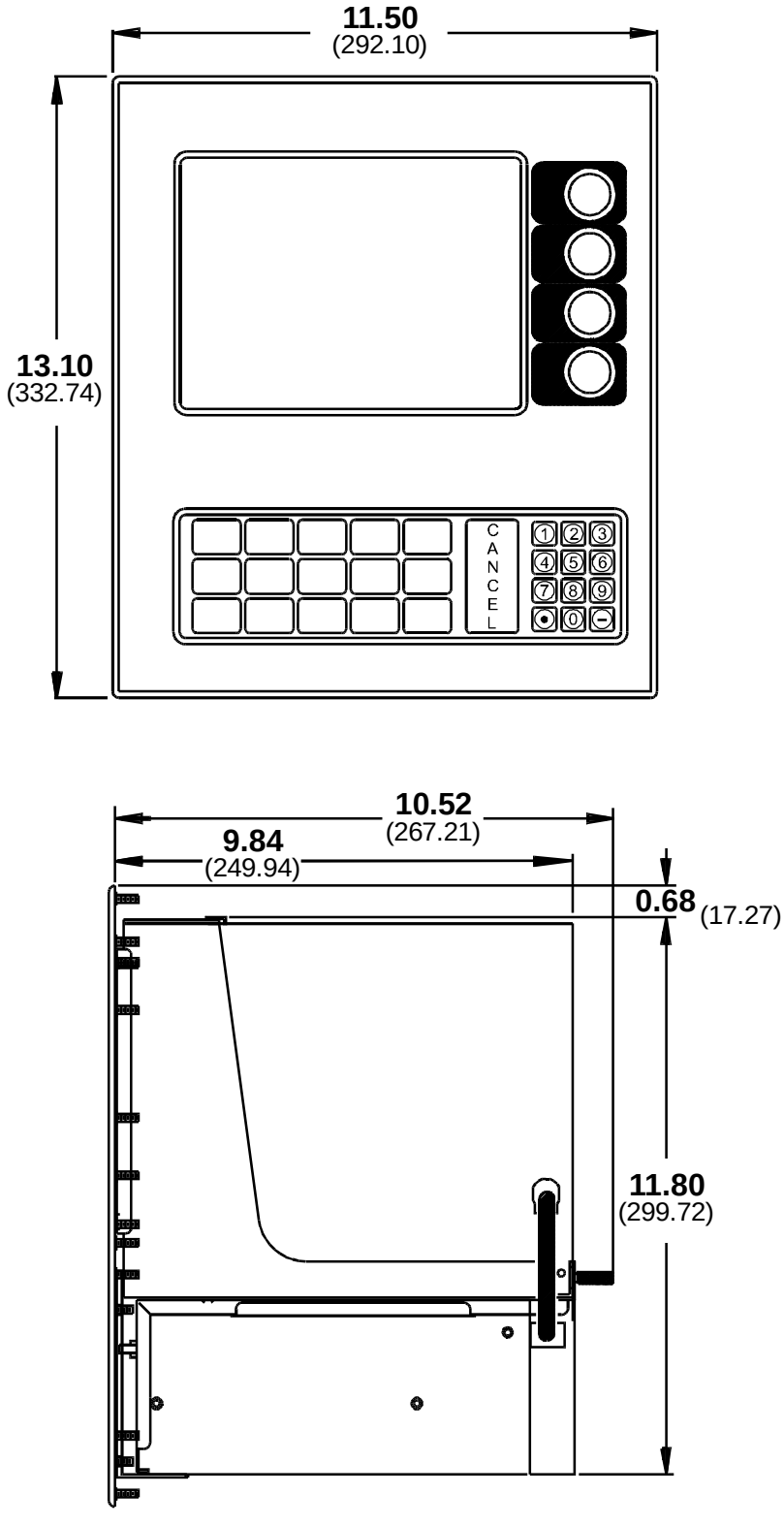




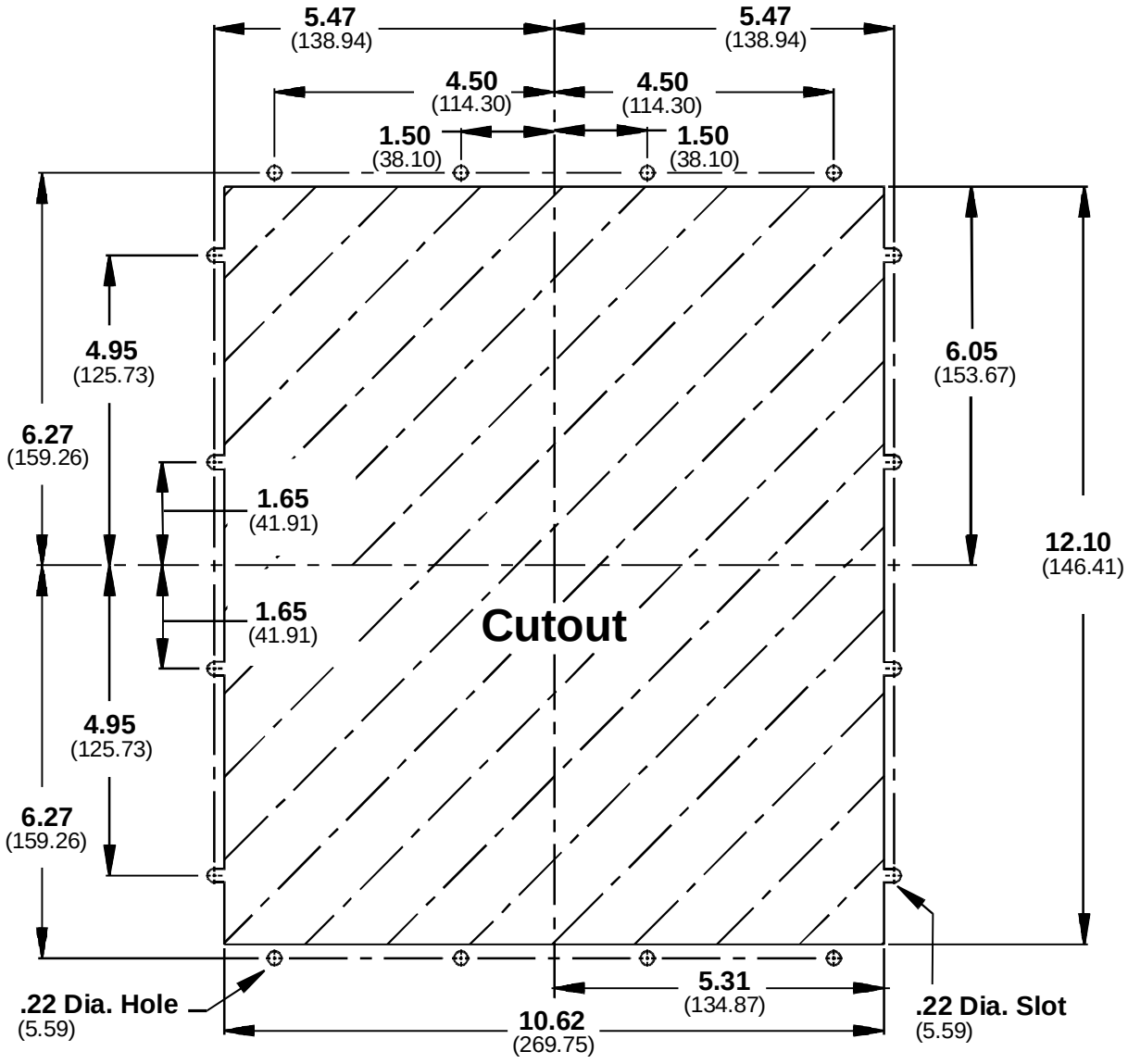
PanelMate 3000 Touchscreen Cutout Dimensions



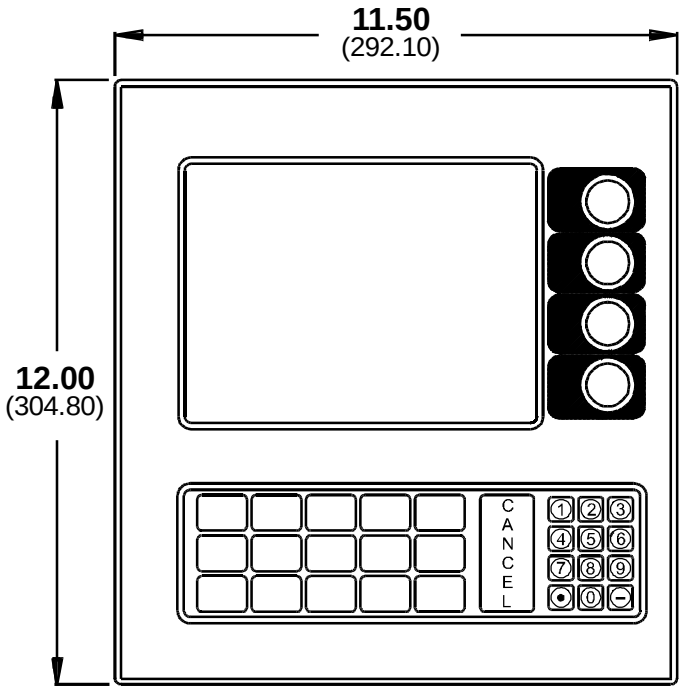
PanelMate 2000 Model 26xx Keyboard Unit Dimensions

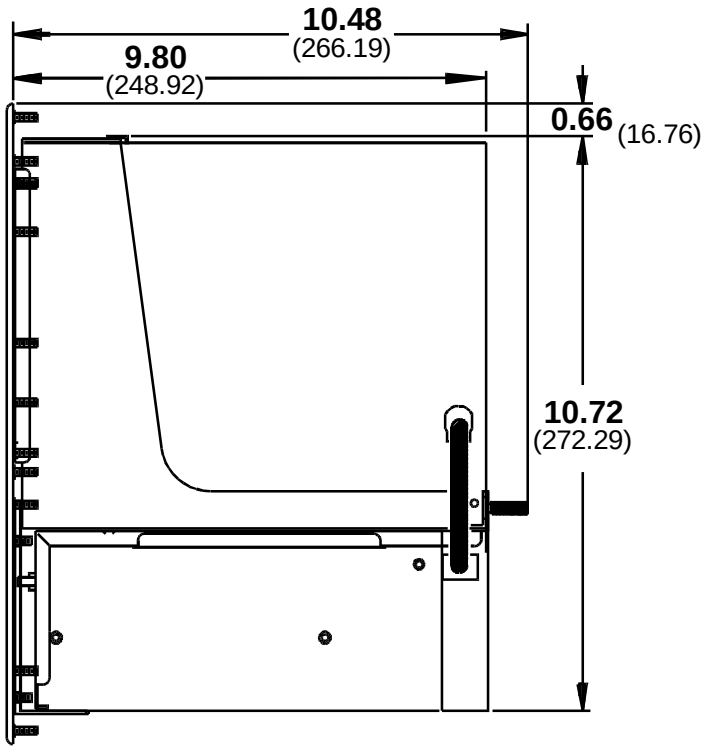


PanelMate 2000 Model 26xx Keyboard Cutout Dimensions

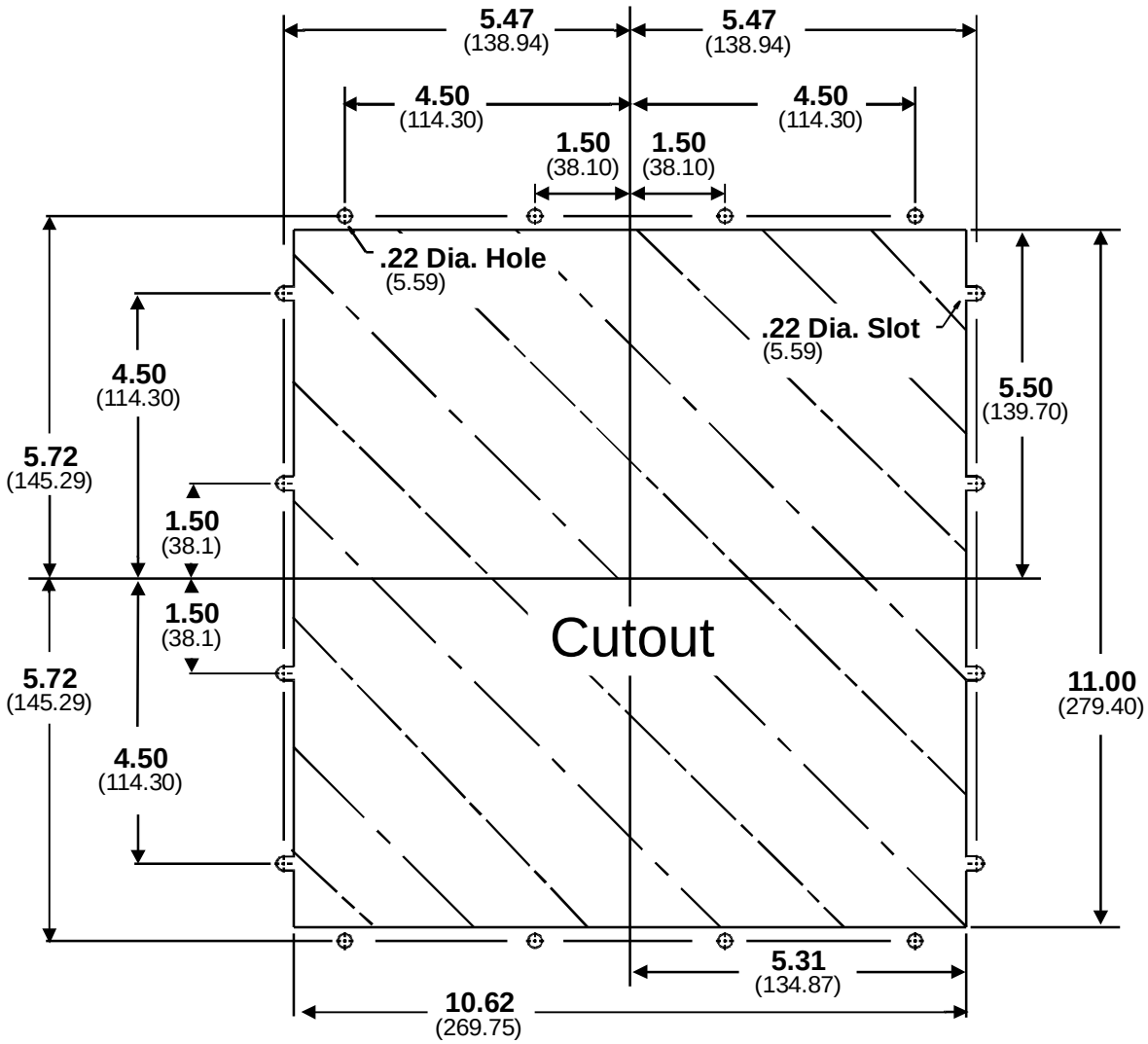


PanelMate 2000 Model 24xx Keyboard Unit Dimensions

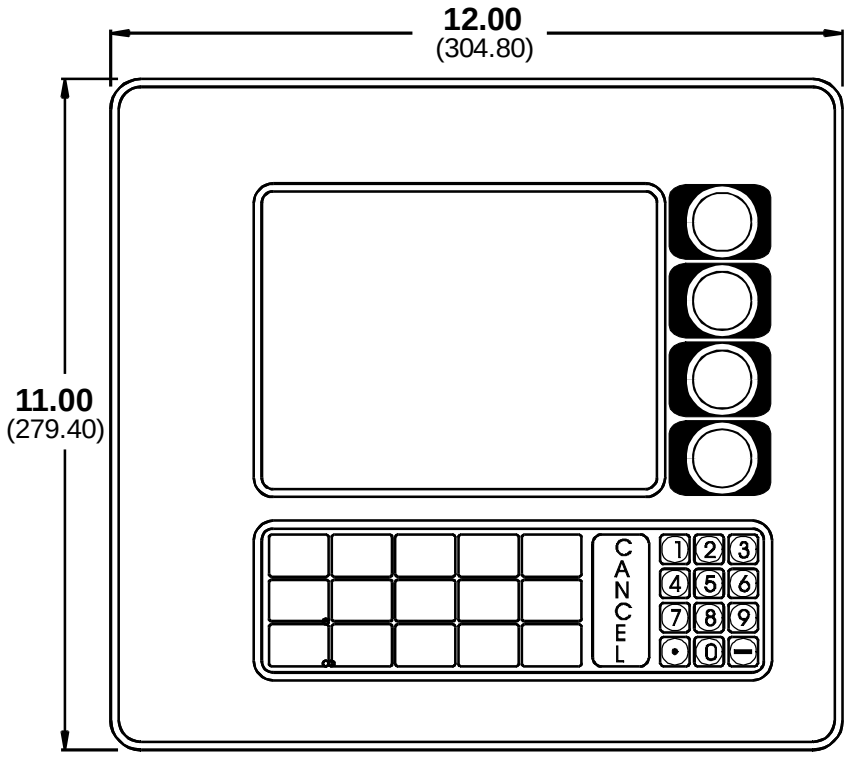


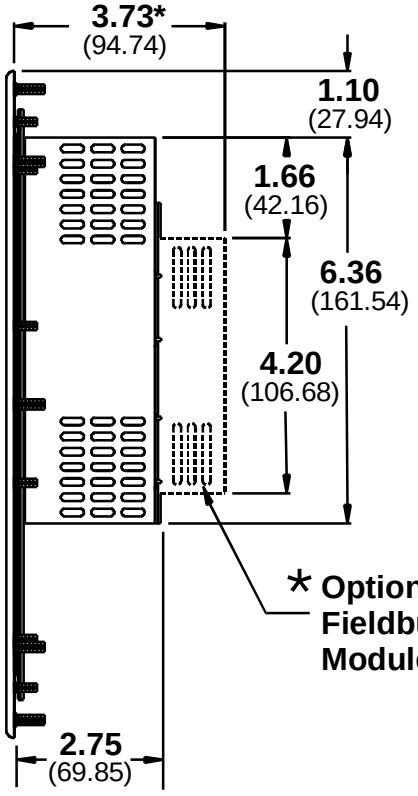


PanelMate 2000 Model 24xx Keyboard Cutout Dimensions

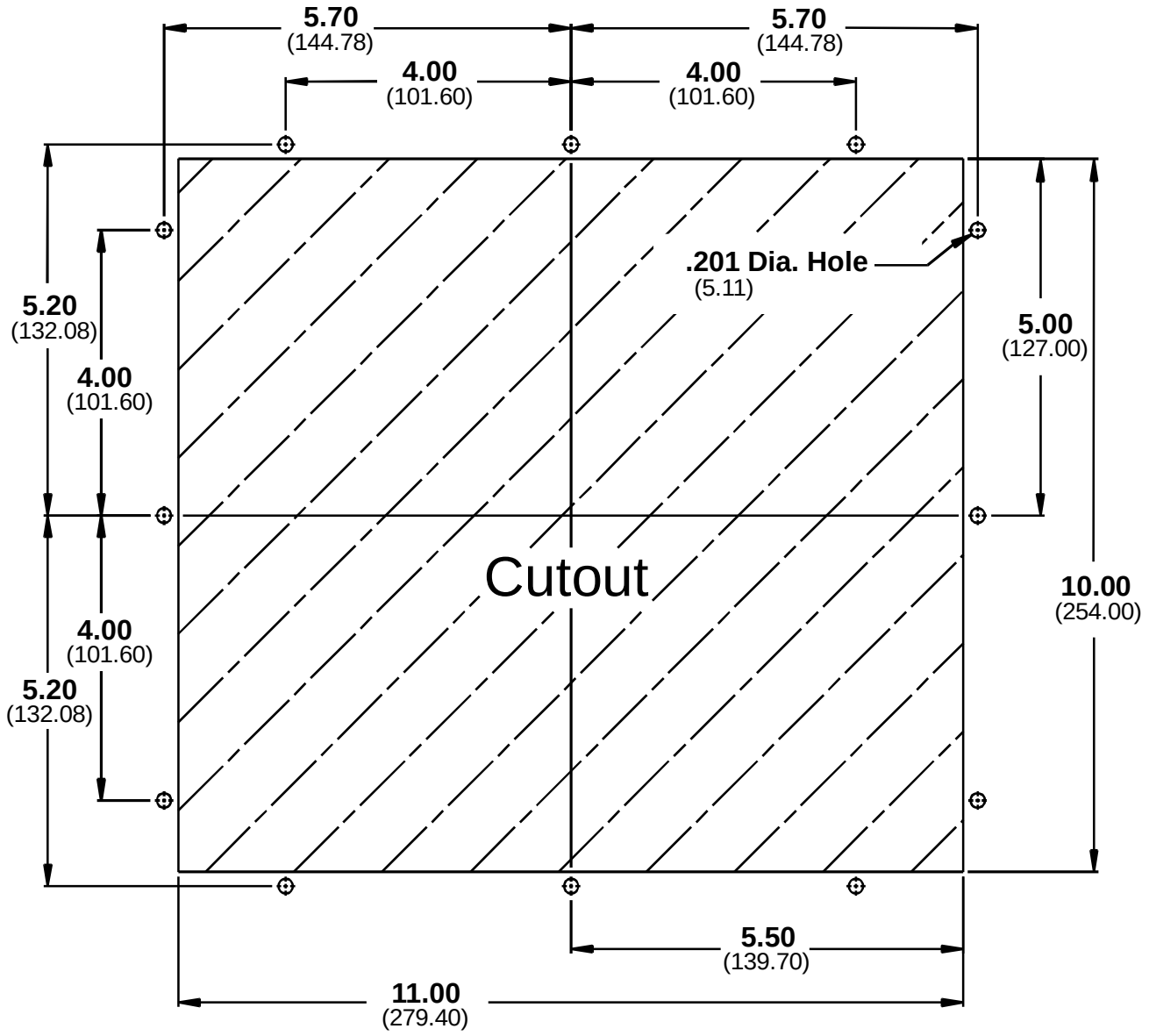


PanelMate 1700 Keyboard Unit Dimensions

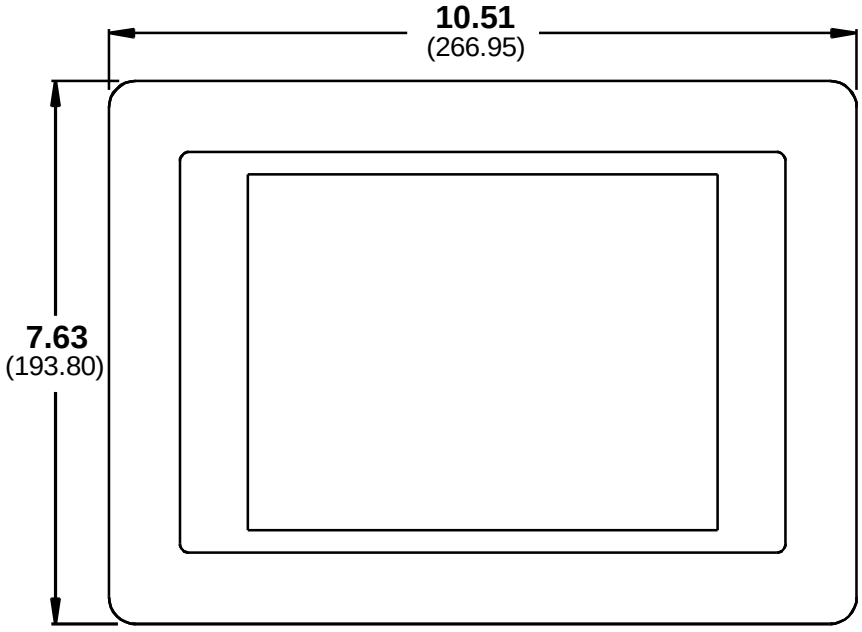


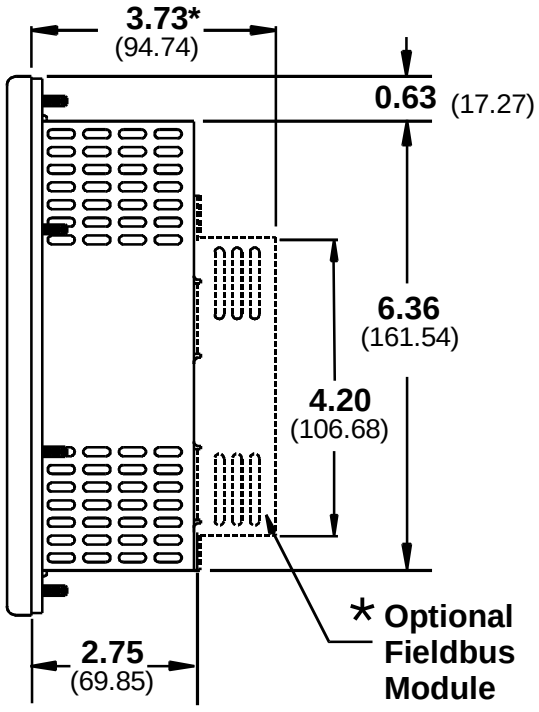


PanelMate 1700 Keyboard Cutout Dimensions

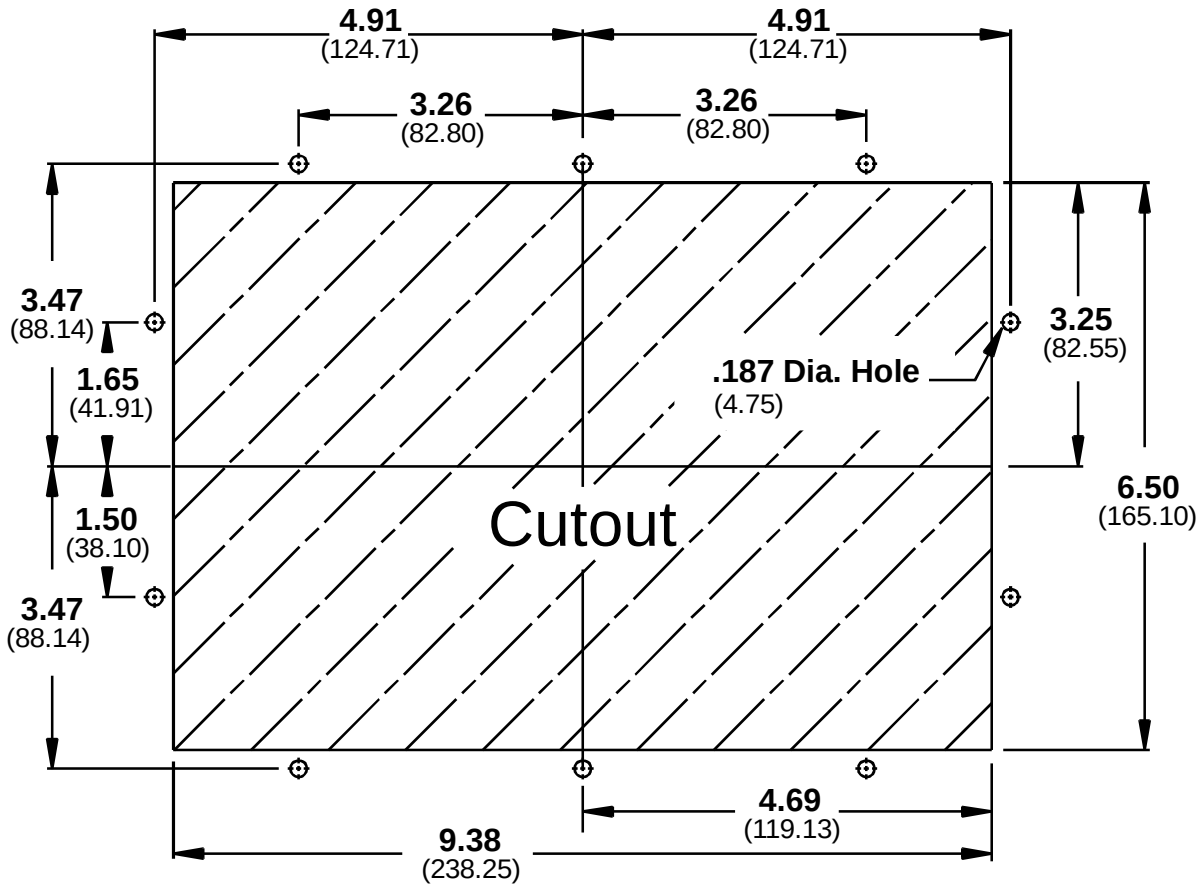


PanelMate 1700 Touchscreen Unit Dimensions

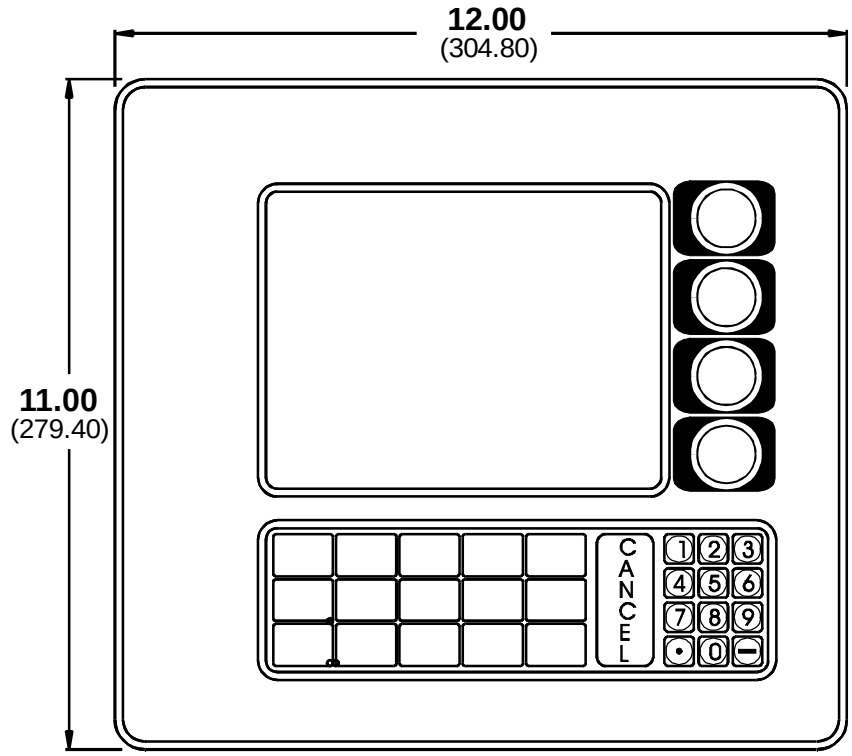


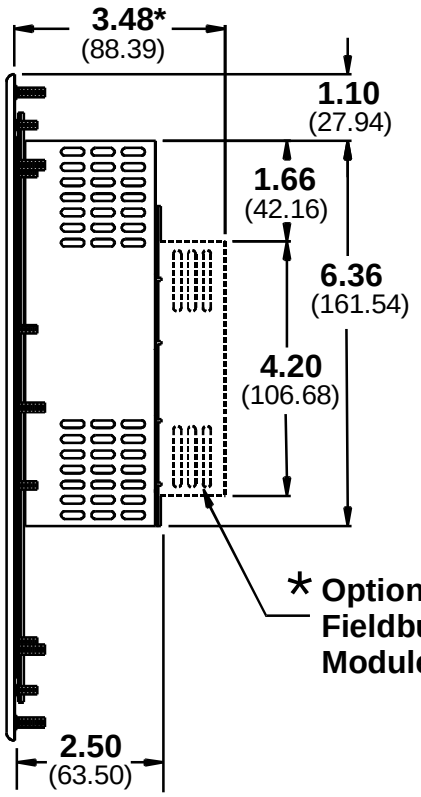


PanelMate 1700 Touchscreen Cutout Dimensions

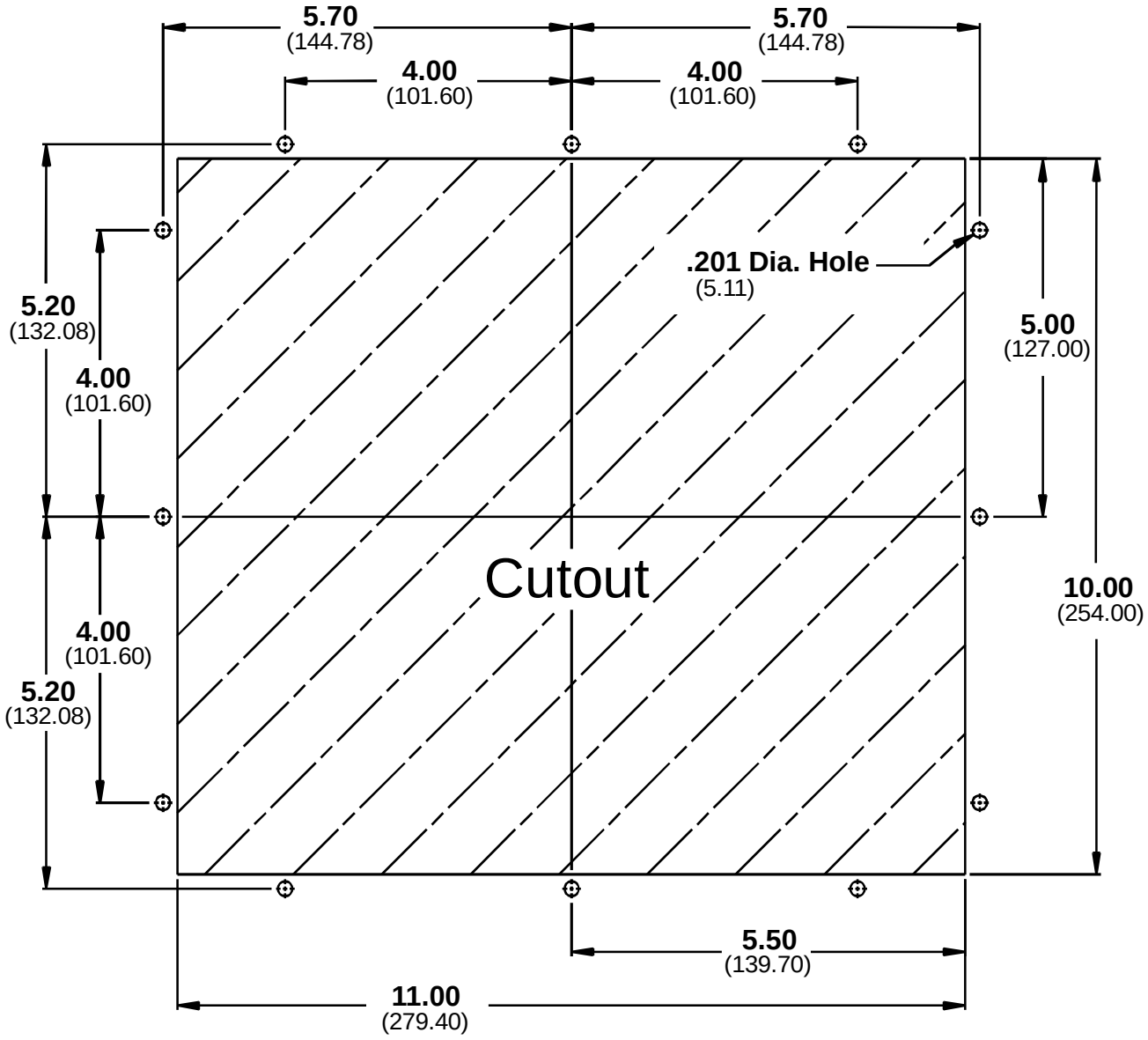


PanelMate 1500 Keyboard Unit Dimensions

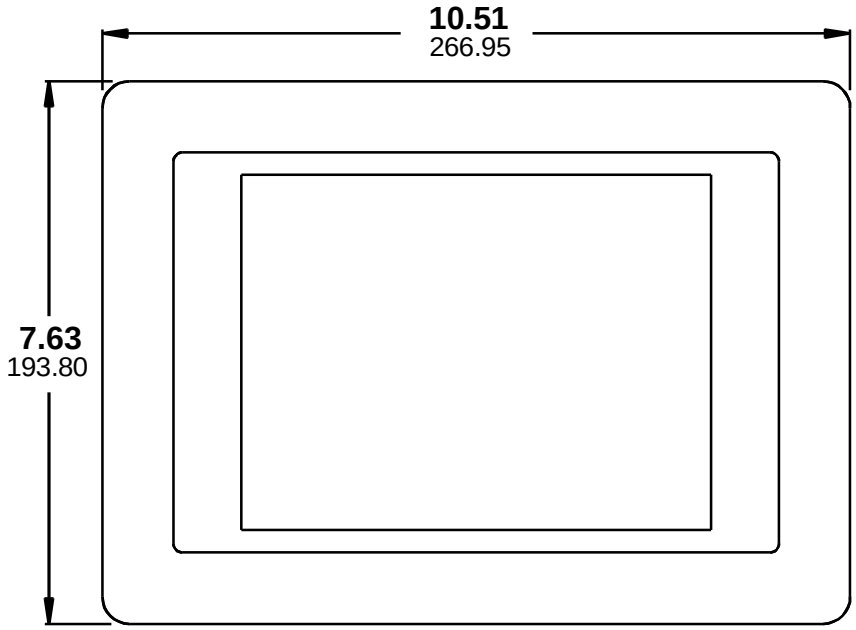


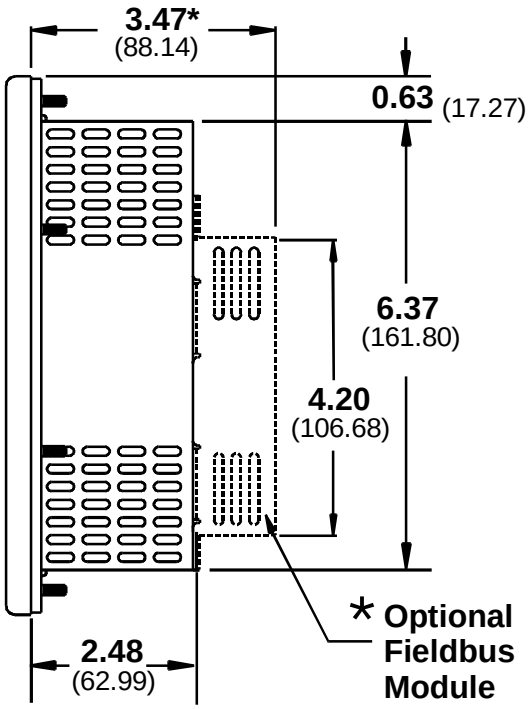


PanelMate 1500 Keyboard Cutout Dimensions



PanelMate 1500 Touchscreen Unit Dimensions





PanelMate 1500 Touchscreen Cutout Dimensions